FORESTRY ABSTRACTS

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FORESTRY ABSTRACTS

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THE CENSUS OF NORWEGIAN WOODLANDS

Review by FINN FROST, B.Sc.
of
The Royal Norwegian Ministry of Agriculture.

DURING the Great War the timber industries of Norway attained a high standard of development. Many new pulp mills were built and the production capacity of the wood-using industries became so great that there was difficulty in supplying timber requirements from domestic resources; to solve this problem, timber was imported from Finland, Russia, and from as far distant as Canada. As at the same time timber-using industries were also expanding rapidly within these countries, the development in Norway of new factories, dependent for material on imported supplies, became a hazardous undertaking. The need for a planned development of domestic timber resources became apparent.

Before any such development could begin it was necessary to obtain data on the forest conditions, stocking and annual increment in the various parts of the country. The State therefore decided to take a census of all Norwegian forests; this work was done in the period from 1919 to 1932. The information obtained proved to be of such great importance to forestry and to the whole national economy that it was decided in 1937 to repeat the census. This second survey is still in progress and has so far been completed only in the heavily wooded counties, Östfold, Akershus, Hedmark and parts of Nord-Tröndelag. In principle the method of survey has been the same in both cases, although a few changes have been made in the technique of the second census as a result of past experience and in order to deal adequately with changed conditions.

METHOD OF CENSUS.

The forest land of Norway makes up about 25 per cent. of the total land area. The census is confined to those regions where forests are of economic importance; this, in fact, includes most of the country other than Vestland, parts of northern Norway and some mountainous districts. Within the selected "census districts" the survey covers all types of country and seven principal types are recognized:—arable land, forest pastures, paddocks, bogs, waste land, water, and productive forest land; detailed analysis is, however, confined to productive forest land, the other types being recorded for area only.

The census is carried out by parties of 5 or 6 men, consisting of the leader (a forest graduate), a note keeper, a compassman, and two or three measurers.

Data are collected by means of a strip survey, the parallel strips being 10 metres wide, and the distance between them varying from one to five kilometres, depending on the size of the census district and on local conditions in relation to the requirements of the survey. Twenty metres is the smallest unit of strip length used in recording changes in type, either generally or within an area of productive forest land.

The width of the strip, the exact measurement of which is of paramount importance, is measured from the centre-line (a 100-metre rope) by means of a pole.[1] In one district only was Näslund's method [cf. *For. Abstr.* 5 (66–7)] used, whereby two lines are run out to mark the boundaries of the strip. Checks on variations in the width of strip are made by occasional measurements of the distance of sample trees from the centre-line. For this purpose the sample trees are grouped according to their distance from the centre-line, i.e. 0–1 metres, 1–2 metres, and so on. The true width of the strip is then found to be the mean of the results of two calculations:—

(1) $x = 2\frac{a_4}{a} + 8$, where a_4 represents the number of trees in the group 4–5 metres from the centre-line and a the average number of trees per metre for the groups 0–3·99 metres from the centre-line; (2) $\frac{x}{4} = \frac{S_1 + S_2 + \ldots\ldots + Sn}{n}$, where S_1, S_2 ..... are the distances of the sample trees from the centre line and n the number of sample trees. Corrections of volume and other relevant data are made only when the error is found to be significant. For some districts the field error in calculating width of strips was ± 35 cm.; however, for the whole of Hedmark it was only − 2 cm.

[1] All measurements along the length of the strips are made separately with a 20-metre steel tape.

All productive forest land is classified according to (*a*) soil, (*b*) stand quality,[2] and (*c*) stand maturity,[3] so that the distribution of soil types and stand quality and maturity classes for the total area is calculated within the survey strips. All sample trees over 10 cm. d.b.h. are grouped into four classes according to quality of butt log (first 5 m. of tree) for timber production, the requirements for each class being defined in detail.[4]

For purposes of collecting more detailed information on forest conditions, sample plots 20 metres long and 10 metres wide are established at intervals of 200 metres along the strips, i.e. there are 5 sample areas in every 1 kilometre of strip length. The classification of the forest area according to tree species, age classes, stand density and forest type is based on the data obtained from these sample areas.

In sample-plot analysis six age classes are used:—1–20 years, 20–40, 40–80, 80–120, 120–160 and over 160 years. There are also six density classes representing various proportions of full stocking. Forest types are classified on the basis of ground vegetation, and seven such types are recognized:—(1) A rich ground cover of grasses and herbs, with species of *Aconitum*, *Geranium* and *Mulgedium*, *Calamagrostis purpurea*, *Deschampsia caespitosa*, tall-growing ferns, etc. This type should be regenerated by planting. (2) Ground cover of mosses and herbs, with species such as *Pleurozium schreberi*, *Hylocomium proliferum*, *Rhytidiadelphus triquetrus*, etc., and with some broad-leaved herbs and grasses, e.g. *Geranium* and *Milium*. (3) *Vaccinium* dominant with some mosses and herbs such as *Pyrola*, *Solidago*, *Trientalis* and the grass *Deschampsia flexuosa*. (4) The mosses mentioned under (2) dominant with a thin cover of *Vaccinium*. This type is suitable for natural regeneration. (5) Water-logged forest land with mosses such as *Sphagnum* and *Polytricum commune*, also some heather, carexes, grasses, etc. (6) Heath land with *Calluna* dominant, and a few mosses. Burning is often required as a preliminary step in regenerating this type. (7) *Cladonia* and *Stereocaulon* dominant, intermingled with patches of short heather.

Sample trees are selected throughout the course of the survey in order to obtain data on height, form, diameter and height increment, bark thickness, etc. The trees are selected mechanically, the number varying with diameter class. Thus in the 5- to 10-cm. class one in every ten trees is selected for analysis while in the 10- to 15-cm. class the basis is one in every eighty trees. The ratios are as follows:—

Diameter class in cm.	0–5	5–10	10–15	15–20	20–25	25–30	30–50
Ratio of number of sample trees to total	1 : 20	1 : 10	1 : 80	1 : 50	1 : 20	1 : 10	1 : 5

A total of 69,697 sample trees was examined in the county of Hedmark.

The volume of the average tree (conifer) over 5 cm. d.b.h. (including bark) is determined by applying measurements of d.b.h. and total height to volume tables; supplementary tables give bark percentages [cf. *Meddelelser fra Det norske Skogforsöksvesen* Nos. 3 and 4]. As a basis for determining volume and growth data, mean figures for all sample trees in each diameter-quality-maturity class are found. Thus for conifers of the diameter class 0–2·5 cm., the volume of the average tree is calculated according to the formula $M = 0{\cdot}21\ (1 + D^2)$ where M is mean volume without bark expressed in cu. dm. and D is d.b.h. under bark expressed in cm.

Increment percentages for trees over 5 cm. d.b.h. are determined from Tor Jonson's tables. For the diameter class 0–2·5 cm. the increment of the mean tree is calculated from the formula $Zm = 0{\cdot}84\ (D - Zr)\ Zr$, where Zm is the annual growth expressed in cu. dm., D the d.b.h. in cm., and Zr the width in cm. of the last annual ring.

As mentioned above, the distance between survey strips varies between 1 and 5 kilometres. The reliability of the survey results in relation to the selected strip interval has been calculated with reference to the mean deviation according to Langsaeter's formula.[5] For each rural district the mean deviations have been found for (1) area

[2] The index to the five quality classes recognized is given in a table and is based on the relation between age at breast height and height of dominant trees. This table also gives the normal increment in cu.m. per dekar for each class:—(1) > 0·68 cu.m.; (2) 0·68–0·44; (3) 0·44–0·29; (4) 0·29–0·19; (5) 0·19–0·12 cu.m.

[3] The five maturity classes are:—(1) forest in process of regeneration; (2) regenerated areas; (3) young stands that have been or should be thinned; (4) middle-aged stands not yet ready for felling; (5) mature stands and woodlands that are ready for regeneration.

[4] Sample trees are classified for quality on the basis of the following specifications for the butt log (first 5 m.).
(*a*) Straight; no branches or few with maximum diameter of 1·5 cm.; rot or wounds must not occur.
(*b*) Branches not numerous with maximum diameter for dry branches of 2 cm. and for green branches of 3 cm.; more branches allowed with maximum diameter of 1½–2 cm.; a long sweep in one direction is permitted; rot must not occur.
(*c*) Butt log must give a sawlog at least 4 m. long; larger branches permitted than in *b*; rot must not extend more than 1 m. from butt end of log.
(*d*) All trees not meeting the requirements listed above.

[5] See Langsaeter, A. Nøyaktigheten ved Linjetaksering av Skog. *Skogforsøksvesenets Meddelelser* 15 (18). The formula is

$$\sigma_M = \sqrt{\frac{\sum_{i=1}^{n} [p_i (X_{i+1} + X_{i-1} - 2X_i)]^2}{6 \left(\sum_{i=1}^{n} p_i \right)^2}}$$

where X_{i-1}, X_i and X_{+1} are census data for volume or some other factor for three consecutive strips and p_i is the length of the centre strip X_i; in calculating the data for column three in above table p_i would be the length of strip in productive forest land.

of productive forest land, (2) volume of conifers, 0–45 cm. d.b.h., per dekar of the total area, and (3) volume of conifers, 0–45 cm. d.b.h. per dekar of productive forest land, as shown in the following table:—

County	*Area of productive forest land in per cent. of total area*		*Volume of conifers, 0–45 cm. d.b.h. per dekar of total area*		*Volume of conifers, 0–45 cm. d.b.h. per dekar of productive forest land*	
	$M \pm {}^{\sigma}M$	${}^{\sigma}M$ in per cent. of M	$M \pm {}^{\sigma}M$	${}^{\sigma}M$ in per cent. of M	$M \pm {}^{\sigma}M$	${}^{\sigma}M$ in per cent. of M
			cu. m.		cu. m.	
Östfold	51·0±0·9	1·8	2·97±0·08	2·5	5·33±0·08	1·5
Akershus	58·3±0·49	0·84	4·38±0·05	1·03	7·3 ±0·04	0·6
Hedmark	58·7±0·5	0·9	3·24±0·03	1·0	5·33±0·03	0·6

RESULTS.

The results of the second survey, which can be indicated only very briefly here, show that, although the annual yield from Norwegian forests is still below what is considered to be normal, there has been a marked increase, since the first survey, in the current annual increment for the three counties for which data are available (Östfold, Akershus, and Hedmark).

In the following table are shown total volume and increment per ha. as determined by the second survey, and also the volume and increment results from the second survey expressed in percentages of those from the first survey.

County	*Volume* (1938)		*Increment* (1938)	
	cu. m./ha	per cent. of 1920 figures	cu. m./ha.	per cent. of 1920 figures
Ostfold	71	132	3·0	144
Akershus	78	112	3·2	119
Hedmark	58	110	2·2	120

The improvement in stocking and growth in recent years has been due largely to a radical change in forest management, made possible mainly by the development of the wood-pulp industry and the consequent demand for relatively small-sized timber. Thinning has become a profitable undertaking, whereas previously only trees of sawn-timber size were cut; this had resulted in an abnormal distribution of age and size classes and a low volume production per acre.

The current annual increment for each of the five quality classes, as determined from the second survey, is given in the following table, together with the normal increment for each class.

Current Annual Increment by quality classes

in cu. m. per ha.

	1	2	3	4	5
Normal	8·0	5·6	3·6	2·4	1·5
Östfold	6·2	4·6	3·0	1·8	1·1
Akershus	6·6	5·0	2·9	1·4	0·5
Hedmark	5·3		2·6	1·2	0·5

STATISTICS OF FELLED TIMBER.

In addition to the information obtained from the two surveys on the productivity and general condition of the forests in each district or parish, data have been made available in recent years on forest depletion as a result of felling. According to the Forest Preservation Act of 1932, forest owners must send to the Parish Forest Council the returns of all timber sold; these returns are subsequently collected and analysed by the Forestry Bureau of the Department of Agriculture. Detailed returns are also made of the quantities of timber floated down the rivers (a principal method of timber transport), and, in addition, there are good statistics on the amount of wood of all kinds used on the farms.

THE CENSUS OF NORWEGIAN WOODLANDS

The position with regard to timber growth and depletion in Norwegian forests about 20 years ago and in 1937–39 is shown below.

	Average for period about 20 years ago	1937–38	1938–39
	cu.m.	cu.m.	cu.m.
Timber sold . . .	5,407,000	7,750,000	3,920,000
Fuelwood sold . . .	863,000	369,000	392,000
Wood used by owner .	2,389,000	2,181,000	2,181,000
Waste	1,022,000	1,000,000*	1,000,000*
Depletion . . .	9,681,000	11,300,000	7,493,000
Annual increment . .	10,448,000	12,500,000*	12,500,000*
Balance	+ 767,000	+1,200,000	+5,007,000

* As estimated by the reviewer

REFERENCES.

[1] Taksering av Norges skoger. Utfört av Landsskogtakseringen. [Census of Norwegian forests. Carried out by the Census of Woodlands (1920–28, and 1937, 1938, 1939)]. Gröndahl and Sön, Oslo. 13 vols. pp. 1683 [N.].

[2] Statistisk årbok for Norge. [Statistical yearbook for Norway.] Det Statistiske Sentralbyrå, Oslo. 1940 (67–72). [N.f.]

ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another or the same language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages.
The term "billion" used in papers originating in North America means a thousand million.

0. GENERAL FORESTRY

01. TERMINOLOGY. BIBLIOGRAPHY. MATHEMATICAL AND STATISTICAL ANALYSIS

01.7 : 02.1. FISHER, R. A., and YATES, F. **Statistical tables for biological, agricultural and medical research.** Oliver and Boyd Ltd., 98 Great Russell St., London, W.C. 1943. pp. viii + 98. [University of London.]

05.3. *Annual Reports*

05.3 (410) : 33.51. GREAT BRITAIN. **Ministry of Fuel and Power. Twenty-first annual report of the Safety in Mines Research Board, 1942.** H.M. Stationery Office, London. 1943. pp. 23.

05.3 (54.4). INDIA. **Annual progress report on the Forest Administration in Ajmer-Merwara for the year 1940–41.** Manager of Publications, Delhi. 1942. pp. 47.

05.3 (66.7). GOLD COAST COLONY. **Report on the Forestry Department for the year 1942–43.** Govt. Printing Department, Accra. 1943. pp. 5.

05.3 (66.9). NIGERIA. **Annual report on Forest Administration for the year 1942.** Forest Department, Ibadan. 1943. pp. 19 + forms.

05.3 (67.6). KENYA. **Forest Department annual report for the year 1942.** Forest Department, Nairobi. 1943. pp. 4 + appendices.

05.3 (68.9). NYASALAND. **Report of the Department of Agriculture for the year 1942.** Govt. Printer, Zomba. [1943?] pp. 16.

05.3 (728.2). BRITISH HONDURAS. **Abridged report of the Forest Department for the year ended 31st December, 1942.** Govt. Printer. 1943. pp. [6] + forms.

05.3 (729.7). TRINIDAD and TOBAGO. **Administration report of the Conservator of Forests for the year 1942.** *Council Paper* No. 22 of 1943. Govt. Printer, Trinidad and Tobago. 1943. pp. 5.

05.3. (74.3). VERMONT. **[Biennial] Report of the Department of Conservation and Development for the term ending June 30, 1942.** Vermont Printing Company, Brattleboro, Vermont. [1942?] pp. 88.

05.3 (74.6). CONNECTICUT. **Fifteenth biennial report of the State Park and Forest Commission for the fiscal years July 1, 1940 to June 30, 1942.** *Public Document* No. 60, 1942. pp. 83.

05.3 (75.4). WEST VIRGINIA. **Epistle to the farm. The report of the Director, West Virginia Agricultural Experiment Station, Morgantown, for the biennium 1940 to 1942.** *Bull. W. Va. agric. Exp. Sta.* No. 307, 1943. pp. 56.

05.3 (931). NEW ZEALAND. **Annual report of the Director of Forestry for the year ended 31st March, 1942.** Govt. Printer, Wellington. 1942. pp. 20.

05.3 (931). NEW ZEALAND. **Annual report of the Director of Forestry for the year ended 31st March, 1943.** Govt. Printer, Wellington. 1943. pp. 24.

05.3 (94). AUSTRALIA. **Sixteenth annual report of the Council for Scientific and Industrial Research, for the year ended 30th June, 1942.** Govt. Printer, Canberra. [1943?] pp. 74.

07. EDUCATION AND RESEARCH. INSTRUMENTS AND TOOLS

07.2 (485) : 33.32. Skogsproduktforskningen. **[Forest products research.]** *Skogen* 29, 1942 (197–8). [Sw.] S.P.S.

A forest products Research Institute is to be established in connexion with the Swedish Technical High School. Laboratories for the investigation of paper, and sulphate, sulphite and mechanical pulps will be included. A close collaboration between the State and the different forest industries is anticipated.

07.7 : 38.3 : 61.32 : 43.1 : 32.91. **Emergency spurs development new equipment.** *W. Cst. Lumberm.* 70 (3), 1943 (27–8, 71).

New units of machinery and other equipment that have been developed at the U.S. Forest Service laboratories include:—(1) a heavy-duty brush mower that cuts saplings up to 2½ in. in diameter; (2) a double-track snow tractor; (3) a land-clearing blade with teeth specially designed for removing rocks and roots; (4) a midget tractor that weighs about 4,200 lb. and can be used to construct a road 48 in. wide; (5) a phototopograph, based on stereopticon principles, that permits the making of aerial photographs which bring out true third dimensions of mountains, valleys, etc.; and (6) a durable low-cost automatic radio relay which extends the range of ultra-high frequency radio apparatus.

09.2. *Pre-history*

09.2 (41.1–4) : 12.26–8. TOMKEIEFF, S. I., and BLACKBURN, K. B. **On the remains of fossil wood enclosed in a Tertiary lava on the Isle of Rum, Inner Hebrides.** *Geol. Mag.* 79, 1942 (14–7). [University of Durham, Newcastle-on-Tyne.] O.R.S.

The fragment of wood here described was found completely enclosed in the lower amygdaloidal zone of a comparatively thin flow of tryachybasalt lava. Its structure appeared to be that of an angiosperm wood of the ring-porous type, closely comparable with that of the modern Chestnut.

09.2 (485) : 12.19.4. JANSON, E., and HALFERT, E. **Pollen analysis of a Swedish bog near Lake Stor-Uman.** *Pap. Mich. Acad. Sci.* 28, 1942 (41–5). O.B.

The bog selected for study is in the southern part of Swedish Lapland, about 20 miles south of the Arctic Circle. The results from this analysis are in general agreement with data obtained from other bogs in northern Sweden. They confirm the fact that Swedish peat profiles are less complex than those studied in America.

09.2 (59.1) : 12.25. MUKHERJEE, A. **A gymnospermous fossil wood from Burma.** *Sci. & Cult.* 8, 1942 (273–4). [Presidency College, Calcutta.] L.S.

The anatomical features of the well-preserved, completely silicified specimen of fossil wood described agree with those of *Aurocarioxylon*.

09.2 (77.6) : 01.4. WILSON, I. T., and POTZGER, J. E. **Pollen records from lakes in Anoka County, Minnesota: a study on methods of sampling.** *Ecology* 24, 1943 (382–92). [Butler University, Indianapolis, Indiana.]

09.2 (79.5) : 12.25 : 12.19.4. HANSEN, H. P. **Paleoecology of two sand dune bogs on the southern Oregon coast.** *Amer. J. Bot.* 30, 1943 (335–40). [Oregon State College, Corvallis, Oregon.] O.B.D.

Data from this study indicate the forest succession for a period of some 4,000 to 7,000 years. The chief dominants of the southern coastal strip of Oregon are Western Hemlock, Sitka Spruce, Douglas Fir, Lowland White Fir, Port Orford Cedar, Western Red Cedar, and Lodgepole Pine. The last species is usually the pioneer arboreal invader of stabilized dunes and is replaced by the others as the environmental conditions are gradually modified.

With exception of two brief periods of Hemlock predominance, Lodgepole Pine has apparently been the most abundant species during the interval recorded by the peat profiles. Whether the converse trends of Lodgepole Pine and Hemlock denote changes in actual or relative abundance is difficult to say. It is possible that the recorded increase in Hemlock is relative, because of dune migration and the burying of Lodgepole Pine stands near the ocean. Temporary stabilization of dunes then permitted Lodgepole Pine again to flourish. The position of the Lodgepole Pine forests windward to the site of the sediments, however, suggests that they may be over-represented in the pollen profiles. *From author's summary.*

09.4. *Forest Statistics*

09.4 (41.5) : 94.3. **Timber in Eire: survey of private woodlands.** *Timb. Tr. J.* 167, 1943 (118).

The total area under woods and forests in Eire is estimated to be 200,000 acres, of which about 90,000 acres are privately owned. Land held in reserve by the authorities for forest planting amounts to about 20,000 acres. It is estimated that in order to make the country as nearly as possible self-sufficient in timber a timber-producing area of about 700,000 acres would be required.

09.4 (47.1) : 98.1. PÖNTYNEN, V. **The consumption of raw material in the Finnish wood industry during the years 1925–1935.** *Acta for. fenn.* 45, 1939 (231–59). [Finn.g.] S.P.S.

A survey is made of timber consumption, timber species distribution, and other factors affecting the Finnish timber industry. Sixty tables are included. Detailed reports are given on the output from the various woodworking industries. The relation between consumption of raw material and labour and power requirements is discussed.

09.4 (485) : 61 : 65 : 98.1. SWEDEN. Riksskogstaxeringen av Västernorrlands lans skogar år 1938. [**National forest survey of Västernorrland, 1938.**] Riksskogstaxeringen av Ljungans, Indalsälvens och Ångermanälvens flodomraden åren 1938 och 1939. [**National forest survey of the Ljungan, Indalsälven and Angermanälven watersheds, 1938 and 1939.**] Riksskogstaxeringen av Jämtlands län åren 1939 och 1940. [**National forest survey of Jämtland, 1939 and 1940.**] 1940 and 1942. [Sw.] S.P.S.

In 1938 work on the second national forest survey of Sweden was started in the northern areas, which are of the greatest importance to the forest industry. During the period 1938–43 all the counties of Norrland were investigated on much the same principles as laid down for the earlier survey in 1923–29. In the present survey, however, the methods have changed to some extent.

The earlier assessment was done entirely by means of a strip survey; the present assessment combines this method with sample-plot estimates. The distance between cruise lines has been reduced so that the area surveyed has been increased by 50 and in some cases 100 per cent. The use of sample plots—as many as 6,000–8,000 for each county—has made possible a closer study of forest conditions at different altitudes and on land in different ownership categories. In the present survey the number of sample trees has been doubled and quality as well as volume of each sample tree has been determined. Accurate measurements have been made to determine the increment for certain periods, particularly for the period between the two surveys.

There have been only slight changes in the *total volume* of standing timber in the districts of central Norrland for which figures are now available in the publications listed above. However, the distribution of diameter classes is not the same as it was 15 years ago. The volume of trees in the larger size classes has decreased considerably, especially in Pine. The annual increment is higher because of the present more favourable distribution of age classes. Most of the very old slow-growing forest was cleared in the period between the two surveys.

In connexion with the heavy cutting for fuelwood that has been necessary in recent years, the national forest survey has made a special fuelwood estimate for some of the southern counties [cf. *For. Abstr.* 5 (214)]. This assessment was made in 1941 and shows that the volume of standing timber in these counties has increased considerably since the earlier survey, particularly with respect to Spruce. An analysis of size-class distribution shows a big increase in trees of the medium and larger diameter classes. In the autumn of 1942 the forests of Örebro county in central Sweden were also surveyed and the same favourable conditions with respect to volume and size classes was found to exist.

09.4 (68) : 98.1–3. MACGILLIVRAY, J. C. **War emphasizes dependence of South Africa upon imported timber.** *B.C. Lumberm.* 27 (8), 1943 (27–8, 78, 80, 82).

The author discusses the timber position in the Union of South Africa with reference to requirements, pre-war imports, and home supplies from both indigenous forests and exotic plantations. During the five-year period 1935–9 the average annual volume of wood and wood products imported into South Africa was 26,706,581 cu. ft., of which about 85 per cent. was of softwood species. The timber imports for this period are listed according to country of origin. Owing to the war many of these sources are no longer available and shipping difficulties have reduced the supplies from other sources. Mainly as a result of this, domestic production has increased from nearly 9 million cu. ft. in 1935–6 to just over 17 million cu. ft. in 1941–2. Of

the latter amount, 421,692 cu. ft. are from indigenous forests and 16,766,308 cu. ft. from the plantations.

The mining industry is the largest single consumer of timber in the Union. Between 1925 and 1940 the consumption of South-African-grown timber and imported timber by this industry increased by 340 per cent. and 225 per cent. respectively.

09.4 (68) : 98.1. NEETHLING, E. J. **Timber and forests. South Africa's needs and resources.** South African Interests Group (Inc.), Cape Town. 1943. pp. 42 + tbls. + gphs. [University of Stellenbosch, S. Africa.]

The author presents statistical and other information on forest resources (indigenous and exotic) and timber consumption in South Africa, and discusses the possible sources of timber supply for the Union during the war and in the post-war period.

09.4 (71) : 97.2 : 98.1. HALLAUER, F. J. **Lumber requirements on the farm: a progress report of the forest survey.** U.S. Forest Service, Washington, D.C. 1942. pp. iii + 75.

09.4 (71) : 33.6 : 98.1. MARQUIS, R. W. **Lumber requirements for shipping purposes (box, crating and dunnage lumber): a progress report of the forest survey.** U.S. Forest Service, Washington, D.C. 1942. pp. iv + 77.

These are two of a series of progress reports giving information on the present consumption of and the probable future trends in requirements for timber and other forest products; they are based on data obtained in the current forest survey of the United States. The first report deals with the lumber requirements for farm use, and the second with lumber consumption and requirements in the wooden box industry and for the shipping of various commodities.

09.4 (71.5) : 98.1 : 23.1 : 43.3. PIRIE, F. W. **The forests and people of New Brunswick.** *Pulp Paper Mag. Can.* 44, 1943 (691–3).

New Brunswick, with a population of 457,000, has a forest area of 14 million acres and an estimated stock of standing timber of 80 million cords and 10 billion bd. ft. The gross value of forest production in 1942 is estimated at $56 million or $125 per capita. Natural reproduction of valuable tree species following logging is usually quick and adequate except after repeated fires; about 3 per cent. of the land is classed as burn, not re-stocking and non-productive forest. The average area burned during the past 10 years is 3·3 acres per 1,000 acres. While 94 per cent. of the forest fires in 1942 were caused by man, 75 per cent. of the damage resulted from fires caused by lightning. Requirements for further development of the forests of the province are noted.

09.4 (75.5). LOTTI, T., and EVANS, T. C. **Virginia's forests.** *For. Surv. Release Appal. For. Exp. Sta.* No. 11, 1942. pp. iii + 13 + 62.

This is a preliminary report of the forest situation in Virginia based on the work of the forest survey organized by the U.S. Forest Service. Detailed statistical data are included in the appendix. [Cf. *For. Abstr.* 5 (87).]

09.4 (75.5) : 12.19 : 12.25–8. EVANS, T. C. **The distribution of commercial forest trees in Virginia.** *For. Surv. Release Appal. For. Exp. Sta.* No. 10, 1942. pp. 32.

The productive forest area of Virginia that is accessible for cutting totals over 14 million acres, or 56 per cent. of the total land area. The most abundant species are Loblolly Pine (*Pinus taeda*) and Shortleaf Pine (*P. echinata*). Important hardwoods include the Oaks, Sweet Gum (*Liquidambar styraciflua*), Black Tupelo (*Nyssa sylvatica*) and Yellow Poplar (*Liriodendron tulipifera*). The present report includes a series of maps showing the distribution of each of the important commercial trees.

09.4 (75.5). CRUIKSHANK, J. W. **The forest situation in the coastal plain of Virginia.** *For. Surv. Release Appal. For. Exp. Sta.* No. 12, 1943. pp. iv + 45 + 26.

This preliminary report presents information on the stocking, growth and drain in forests of the coastal plain of Virginia, based on data obtained by the U.S. forest survey. The forested area of this region amounts to about 4 million acres or 62 per cent. of the total land area. The main tree species is Loblolly Pine (*Pinus taeda*). The total volume of sound timber, including bark, is 74·3 million cords. In 1940 net annual increment amounted to 749 million bd. ft. compared with a total commodity drain of 606 million bd. ft.

09.4 (75.5). DUERR, W. A., EVANS, T. C., and MORRILL, G. E. **The forest situation in Piedmont Virginia.** *For. Surv. Release Appal. For. Exp. Sta.* No. 13, 1943. pp. iii + 83.

This preliminary report presents information of the stocking, growth and drain in forests of the Piedmont district of Virginia, based on data obtained by the U.S. forest survey. The forested area of this region amounts to 6 million acres or 60 per cent. of the total land area. The growing stock is comprised largely (66 per cent.) of hardwoods, mostly Oaks. The volume of sound wood is 57½ million cords. In 1940 current annual increment amounted to 624 million bd. ft. compared with a total commodity drain of 468 million bd. ft.

09.4 (75.8) : 98.1–2 : 97 : 91 : 34.26. SPILLERS, A. R., and ELDREDGE, I. F. **Georgia forest resources and industries.** *Misc. Publ. U.S. Dep. Agric.* No. 501, 1943. pp. iii + 70 + map. [Southern Forest Exp. Sta.]

The information in this bulletin is based on the findings of the U.S. forest survey. The forest area of Georgia is slightly over 21 million acres or 57 per cent. of the total land area. There are about 2½ million acres of old growth and 17½ million acres of second growth, half of which is of saw-timber size.

The net volume of saw timber amounts to 46 billion bd. ft., of which more than 70 per cent. is Pine, the most important species being Loblolly Pine (*Pinus taeda*). In 1937 the growth of saw timber exceeded drain (mortality and commodity drain) by 843 million bd. ft. Most of the increment was produced by second growth stands.

The gum naval stores industry of Georgia, the largest in the United States, is mainly in the southern part of the State where about 8 million acres of forest are in turpentine production.

09.4 (77.5) : 97.1 : 98.1 : 94. MACON, J. W. **The forest situation in Burnett County, Wisconsin.** *Econ. Note Lake St. For. Exp. Sta.* No. 17, 1942. pp. 20.

09.4 (77.8) : 98.2 : 12.25–8 : 33.0. SECHRIST, W. C., and PECK, R. H. **Missouri woods and wood-using industries.** *Bull. Mo. agric. Exp. Sta.* No. 442, 1942. pp. 19.

Brief descriptions are given of the wood-using industries of Missouri with figures for volumes of wood

used or of products manufactured; notes are included on each of the commercial timber species and their uses.

09.4 (79.6) : 98.1–2: 97 : 91. HUTCHISON, S. B., and WINTERS, R. K. **Northern Idaho forest resources and industries.** *Misc. Publ. U.S. Dep. Agric.* No. 508, 1942. pp. iv + 75 + map. [Northern Rocky Mt. Forest & Range Exp. Sta.]

This report is based on the findings of the U.S. forest survey in northern Idaho. It gives an account of the physical characteristics and of economic and other factors in the region, and includes information on forest resources, ownership, industry, protection, management possibilities, etc. The forest land of northern Idaho covers 10·3 million acres or about four-fifths of the total area; this includes 3·4 million acres of non-commercial forest land. The most important commercial forest is the Western White Pine type (*Pinus monticola*) which covers 2·4 million acres.

The commercial sawtimber stand totals 38 billion bd. ft. distributed among the tree species as follows (in billions of bd. ft.):—Western White Pine (10), Douglas Fir (6·4), Grand Fir (5·7), Ponderosa Pine (4·9), Western Larch (4·1), Western Red Cedar (3·3), Engelmann Spruce (2·4), other species 2·1. The present allowable annual cut is 518 million bd. ft. for the total stand and 140 million bd. ft. for Western White Pine.

Thirty-nine per cent. of the commercial forest area is privately owned, 9 per cent. is State owned and 47 per cent. is in national forests.

09.7. *Monographs of Individual Forest Regions*

09.7 (481) : 12.19. VE, S. **Forest and trees in inner Sogn from Laerdal to Fillefjell.** *Medd. Vestl. forstl. Forøksstа.* No. 23, 1940 (1–224). [Nor.g.] S.P.S.

This is a monograph on conditions of tree growth around Laerdal fiord (lat. 61° 10′ N.), in the Laerdal valley east of the fiord and in part of its continuation towards the pass on the watershed between Sogn and Opland (Gudbrandsdal). The tree growth consists mainly of Pine woods along the coast, and Birch and Alder in the valley. The range of tree growth is determined as much by man's influence during the past 1,000 years, and by storms, torrents, avalanches, earth-slips, etc., as by temperature factors. There was no indication that the climatic upper limit had moved upward in the last 100 years, although this might have been expected from the recent improvement in climate. [Cf. *For. Abstr.* 5 (159).]

09.7 (72) : 12.19 : 12.25–8. OCHOTERENA. **Outline of the geographic distribution of plants in Mexico.** *Chron. bot.* 7, 1943 (311–5). [Instituto de Biología, Mexico, D.F.] O.B.D.

Mexico may be divided geographically into the following 7 regions:—

1. *Coastal and dune region*, which consists of a sandy treeless belt along the coast.

2. *Tropical region* in which species of *Eriodendron*, *Pisonia*, and *Byrsonima*, as well as various vines and woody shrubs are found.

3. *Subtropical region:* coniferous trees extend upwards from an altitude of 1,250 m., increasing in numbers from 1,800 m. to 2,200 m. above sea level, and various species of *Quercus* (*Q. sartorii*, *Q. insignis*, *Q. polymorpha*, *Q. xalapensis*, etc.) are abundant. *Pinus montezumae*, *P. patula*, *P. teocote*, and *P. leiophylla* are among the more common conifers, while trees or shrubs of the genera *Liquidambar*, *Acacia*, *Yucca*, and *Croton* are also found in this region.

4. *Desert regions* in various parts of the country: tree species include *Prosopis cinerascens*, *Guaiacum coulteri*, *Randia thurberi*, *Bumelia occidentalis*, *Acacia occidentalis*, *Forchammeria watsoni*, *Albizzia occidentalis*, *Prosopis juliflora glandulosa*, *P. juliflora velutina*, *Pithecolobium dulce*, *P. tortum*, *Acacia farnesiana*, *Cercidium* sp., *Haematoxylon brasiletto*, numerous Burseraceae (with the genus *Elaphrium* predominant) and Anacardiaceae. In the southern desert region (16°–20° N. lat.) where scanty rain falls in the form of brief heavy showers, immediately absorbed by the main substratum of calcareous rocks, the outstanding trees are *Ipomaea arborescens*, *Cordia boissieri*, *Ceiba pentandra*, *Acacia hindsii*, *A. farnesiana*, *Prosopis juliflora* and species of *Crescentia*, *Parosela*, *Cassia*, and *Goldmania*.

5. *Region of Central Plateau:* the most important tree species are *Schinus molle*, *Leucopremna mexicana*, *Enterolobium cyclocarpum* and species of *Acacia* and *Ficus*.

6. *Region of the 'Sierra Madre':* the forest is the distinctive vegetation of this region (2,200–3,200 m. above sea-level). It contains characteristic groups of *Pinus*—mainly *P. lambertiana* and *P. ayacahuite* on the higher levels, and *P. cembroides*, *P. lumholtzii*, *P. eslavae*, *P. pseudostrobus*, *P. teocote*, *P. hartwegii*, *P. leiophylla* and *P. montezumae* on the lower levels. Associated with these Pines are many species of *Quercus*.

7. *Region of the top of the high mountains:* includes the upper limit of the Pinaceae. In this region *Juniperus mexicana* is known to reach a height of 4,400 m.

09.7 (728.6) : 12.19.2 : 12.26–8 : 98.1. BARBOUR, W. R. **The Oak forests of Costa Rica.** *Trop. Woods* No. 75, 1943 (1–4). [U.S. Forest Service.]

With the development of the Inter-American Highway, the previously inaccessible Oak forests of the Costa Rican mountains may now be opened to exploitation. These forests have no well-defined lower altitudinal limit. On the Atlantic side they descend the ridges to 3,000 ft. or lower, while on the Pacific side they merge into the mixed evergreen rain forests of the 'tierra templada' at about 5,000 ft. At 6,000–7,000 ft. *Quercus* spp. begin to predominate, and from 8,000 ft. to over 10,000 ft., where the woods terminate abruptly in páramos, the forests consist almost entirely of Oak. Optimum development is reached at elevations of 7,500 to 8,500 ft. on the rounded crest of the Cordillera, where the principal species, *Quercus copeyensis* Muller, may exceed 120 ft. in height and 96 in. d.b.h. Clear boles of 80 ft. or more are common. Other Oak species present in limited quantities include *Q. borucasana*, *Q. aaata* and *Q. eugeniaefolia*. It is estimated that some parts of the forest contain at least 60,000 bd. ft. of timber per acre, while an average stand per acre of 10,000 ft. for the entire type is regarded as a conservative estimate.

09.7 (86) : 12.19.2 : 98.2. WYLIE, K. H. **The agriculture of Colombia.** *Foreign agric. Bull. U.S. Dep. Agric.* No. 1, 1942. pp. 160. A.P.B.

It is estimated that 150 to 175 million acres, or 50 to 60 per cent. of the total land area of Colombia, are covered with forests. These are of 4 types:—(1) the Mangrove swamps of the Caribbean coast; (2) the dry, thorn forests of the Goajira Peninsula; (3) the tropical

jungles found on the coast and along the rivers, up to an elevation of 5,000 ft.; (4) the Oak, Pine, Walnut and Willow forests higher up the mountains.

Although these forests contain many useful species, there has as yet been no systematic exploitation of forest resources, and the value of exports of forest products in recent years has been less than 0·5 per cent. of that of the total exports.

The physical and economic background of agriculture in Colombia, as well as its development and present status, are discussed in this publication, and notes are given on the main crops under cultivation.

1. FUNDAMENTAL NATURAL LAWS OF THE FOREST

11.1. *Atmosphere*

11.11. Air Temperature

11.11 (481) : 12.19. HESSELBERG, T. **The rise of temperature in Norway in our time.** *Tidsskr. Skogbr.* 48, 1940 (331–42). [Nor.] S.P.S.

An abstract of a paper by T. Hesselberg and B. J. Birkeland in *Geofyiske Publikasjoner* 14 (4), 1940. It is shown that during the past few decades the autumn, winter and spring temperatures in Norway have increased, particularly in the north, to an extent corresponding to an altitudinal rise of the timber line by some 300 ft. and to a movement northward of certain limits of plant distribution by nearly 200 miles. In fact, conditions in the highlands have markedly improved for agriculture during the last 50 years, and the forest (Birch in particular) appears actually to have moved up the mountains.

11.11 : 11.41.1 : 01.4 : 12.19. DAUBENMIRE, R. F. **Temperature gradients near the soil surface with reference to techniques of measurement in forest ecology.** *J. For.* 41, 1943 (601–3). [University of Idaho.]

Using a thermocouple, measurements were taken of the temperature at the soil surface, at depths of 5 and 10 mm., and at an elevation of 5 mm. above ground, the colour (black, grey and white), moisture (dry and wet), and exposure (exposed and shaded) of the soil surface being varied in order to determine the effect of these factors on the measurement of soil temperature. It is concluded that, while true surface temperature of shaded soils can be approximated within about a degree by the use of a thermometer having a sensitive unit 5 mm. or less is diameter, for soil surfaces under full insolation, particularly dark surfaces, the degree of error involved in using ordinary thermometers is very great. Furthermore, the vertical gradient in temperature is not the same for shaded and exposed soils so that errors in measurement with larger thermometers cannot be assumed to be constant under varying degrees of insolation.

11.14. Precipitations. Evaporation. Humidity

11.14 : 07.7 : 43.01. HAYES, G. L. **Reliability of the Forest Service type rain-gage.** *Repr.* from *Mon. Weather Rev.* 70, 1942 (267–8 + plate). [Northern Rocky Mt. Forest & Range Exp. Sta.]

The Forest Service type gauge is described as 'a galvanized sheet iron receiver having a vertical rim that extends two inches above the funnel, a galvanized sheet iron overflow can, and an inner measuring tube of seamless brass closed at one end by a brass disk'. Comparison of results with the Forest Service gauge, the Weather Bureau standard gauge, and the Friez tipping-bucket type gauge showed the inexpensive Forest Service type of rain gauge to be entirely dependable for all ordinary measurements of rainfall where large capacity and automatic recording are not required.

11.4. *Soil*

11.41. Soil Physics

11.41.7 (47.1). AALTONEN, V. T. **Concerning soil classification.** *Commun. Inst. for. Fenn.* 29 (6), 1941 (1–42). [Finn.g.] S.P.S.

For classification of soil in the laboratory a mechanical analysis is made and the moisture equivalent is determined according to Bouyoucos. For classification in the field the soil (loams, etc.) is placed in a test tube to a height of 3 cm., and a 20-per-cent. salt solution is added to a height of 10 cm. The test tube and contents are shaken for 1 minute and allowed to settle for three minutes, and the column of soil at the bottom of the tube is then measured and examined for grit. Sands are sieved and the gravel content is judged by eye.

11.42. Soil Chemistry

11.42 : 11.47.6 : 21.32 : 12.25. SÜCHTING, H. **The nutrient relations of forests. VIII. The methods of determining the nutrient status of forest soils.** *Bodenk. PflErnähr.* 28, 1942 (340–61). Chem. Abstr. 37 (4174–5). P.R.

Determinations of pH (H_2O), pH (KCl), exchange acidity, total N, and P_2O_5, CaO and K_2O soluble in 10 per cent. HCl are reported for the 0–15 and 25–40 cm. layers of 40 forest soils. The uptakes of K and P by Scotch Pines in the standard method and by rye in the Neubauer method were compared with the solubility, respectively, in 1 per cent. NH_4Cl solution and 1 per cent. citric acid solution. The standard vegetative test with Scotch Pines on light soils has some defects. The fertilizer salts, in the 500 g. soil used, appear to affect the growth unfavourably. The chemical method of determining the K nutrient status gives the same order of magnitude and same relative order as the standard method, with a few unimportant deviations. Except for some variations the chemical method for P agrees with the standard method. The nutrient status in N as indicated by the N uptake of Scotch Pines bears a significant relation to the total N content of the soil. The seedling method of Neubauer shows with determined exceptions agreement with the standard method and the chemical methods. The P withdrawal and the order of magnitude of the K withdrawal, by rye, are similar to those of the withdrawals by Scotch Pine. The grouping of the soils according to nutrient status by the Neubauer method and by the standard method leads to a fundamentally similar and practically equal evaluation. The determined exceptions are the neutral weathered limestone soils where the rye withdrew larger amounts of K than the Scotch Pine, and the acid soils where the withdrawal by rye was clearly less but the difference was not great enough to cause more than a small displacement of the soils in the nutrient series. Most of the soils tested were strongly deficient in P and N and deficient in K. Subsoils were only a little worse than the surface soils.

11.43. Biology of Soil, including Mycorrhiza

11.43.1 : 12.25. McComb, A. L., and Sass, J. E. **Some structural features of mycorrhizae on coniferous seedlings.** *Abstr.* in *Proc. Iowa Acad. Sci.* 49, 1942 (255). A.P.B.

Development of mycorrhizae was found to be promoted by inoculating nursery soil with humus and top soil from well-established coniferous plantations, or by application of phosphorus fertilizer. In one type the root has a mantle of mycelium with abundant clamp connexions. The internal mycelium is intercellular and segmented into short, straight-sided cells. The second type has a mantle of much coarser, 'monilioid' mycelium. The internal mycelium is intracellular, partly peripheral along the cell walls, and segmented into rounded cells. Abundant coarse, blunt hyphae protrude into the vacuoles. In some roots the outer cortical cells contain large wefts of extremely fine mycelium. It is not improbable that two or three fungal organisms are involved, the relative prominence of each being determined by cultural treatment. [Cf. *For. Abstr.* 5 (87–8).]

11.43.1 : 12.25 : 12.11.1. Björkman, E. **The conditions favouring the formation of mycorrhizae in Pine and Spruce.** *Symb. bot. upsaliens.* 6 (2), 1942 (1–190). [G.e.] S.P.S.

In order to learn something of the causes of variation in the mycorrhizal habit of conifers, extensive experiments were made under controlled conditions, using soil cultures and inoculated pure cultures. While the results at first indicated an extremely complex situation, the author suggests an explanation on the basis of the interaction of light and supplies of available nitrogen and phosphorus. Mycorrhizal fungi attack the roots of plants in order to obtain soluble carbohydrates, and confine themselves to roots that have a certain surplus of energy food. This condition is possible only if photosynthesis is rapid and is not followed too quickly by the production of proteins. With a good supply of nutrients the tree is able to build up proteins as fast as the output of carbohydrates will permit. Under these conditions there will be little food available in the roots and mycorrhizae will not form. If there is a scarcity of a nutrient, such as nitrogen or phosphorus, protein synthesis will slow down and reserves of sugars will become available in the roots, thus inducing the fungi to form mycorrhizae. A severe shortage of these nutrients may, however, result in a slowing down of primary synthesis as well and so make conditions unfavourable for mycorrhizal infection.

This theory may also account for the variations in the development of nodules on Alder and various legumes and so offer a clue to a whole class of symbiotic relations. The theory is supported by a nearly linear relationship between frequency of mycorrhizae and content of reducing substances in the roots.

The author has replaced the carbon-nitrogen-ratio concept by one that takes into account the interaction of phosphorus and nitrogen and at the same time incorporates the view that mycorrhizae are formed when there is a lack of balance in available nutrients. [Cf. Hatch, A. B. The physical basis of mycotrophy in *Pinus*. *Black Rock For. Bull.* No. 6, 1937. pp. 168.]

Romell in his review of this paper [cf. *Svenska SkogsvFören. Tidskr.* 40, 1942 (347–53)] emphasizes the importance of Björkman's interpretation in showing how simply a mutually beneficial symbiosis may be brought about and regulated by conditions of supply and demand. A fresh concept of the ectotrophic mycorrhizal relation should result. It should be named the Frank–Björkman theory, being a development of Frank's very first view (1885), later abandoned by himself. One has only to assume, as Hatch and others have done, that the mycorrhizal fungi may in some way act as roots for their hosts. On this condition it follows from Björkman's theory that a mutually profitable arrangement will begin whenever conditions permit and will continue as long as it serves a useful purpose. There is no need to assume a mysteriously changing 'virulence', an idea that has in fact led some investigators into difficulties, as has also the underlying idea that symbionts are fundamentally opposed to one another.

11.43.2 : 11.44 : 11.41.5–6 : 13.2. Lindquist, B. Undersökningar över några skandinaviska daggmaskarters betydelse för lövförnans omvandling och för mulljordens struktur i svensk skogsmark. [**Studies on the importance of some Scandinavian earthworms for the decomposition of leaf litter and for determining the structure of mull in Swedish forest soils.**] *Svenska SkogsvFören. Tidskr.* 39, 1941 (179–242). [Sw.g.]

From these studies it was found that earthworms preferred the litter of certain tree species, e.g. the dead leaves of Elm, Ash and Birch; they ate sparingly of leaves of Oak and Beech, and did not touch Pine or Spruce needles. In consuming litter the two large species *Lumbricus terrestris* and *Allolobophora longa* were more efficient than *A. caliginosa* or the small species *Eisenia rosea* and *Dendrobaena octaedra*. Under the same soil conditions larger worms made larger casts. Dead worms decomposed rapidly in the soil.

11.43.2 : 11.41.1 : 11.44 : 13.15. Pearse, A. S. **Effects of burning-over and raking-off litter on certain soil animals in the Duke Forest.** *Amer. Midl. Nat.* 29, 1943 (406–24). L.S.

In order to investigate the effects of litter removal on the soil fauna of certain areas in the Duke Forest three 0·1-acre plots in a stand of *Pinus taeda* were set aside in 1934 for experimental purposes. One of the plots was burned over at intervals, the second was left intact, and on the third plot all logs and fallen trees were removed and the litter raked off every two years. Collections of soil fauna were made in each plot every three months for five years (1937–41), and the temperature of the surface litter and of the soil at a depth of 3 in. was recorded before each collection. Results showed that for the undisturbed plot the temperatures, both on the litter surface and in the soil, were less extreme than for the other plots. The burned-over plot did not differ greatly from the raked plot, but showed a rather wider range of surface temperatures and a more limited range in soil temperatures. The number of animals collected from the undisturbed plot was substantially higher than that of animals collected from the two other plots, the percentage of animals being slightly lower in the raked plot than in the burned-over plot.

The distribution of the main soil fauna—earthworms, centipedes and millipedes, beetles and ants—is outlined, and a complete list is given of all the animals collected.

11.43.2 : 13.2 : 11.44 : 12.25. Hope, J. G. **An investigation of the litter fauna of two types of Pine forest.** *Bull. Wagner Inst. Sci. Philad.* 18 (1), 1943 (1–7). P.O.

A study was made of the litter and its fauna under stands of *Pinus rigida* and *Tsuga canadensis* in the north-eastern United States. It was found that the Hemlock litter fauna was poorer in both variety and numbers of animals, the estimated totals of animals per square metre being 138,112 for the Pine and 63,480 for the Hemlock litter. Acarina represented 62·81 per cent. of the *Pinus* fauna and 98·93 per cent. of the *Tsuga* fauna; Collembola represented 36·98 per cent. of the *Pinus* and 0·93 per cent. of the *Tsuga* fauna.

11.44. Litter. Surface Humus

11.44 (481) : 12.14.5 : 12.11.11 : 12.25 : 12.26–8 : 56.04 : 11.47.2. Mork, E. Om strøfallet i våre skoger. **[The litter-fall in Norwegian woods.]** *Medd. norske Skogforsøksv.* No. 29, 1942 (297–365). [Nor.g.]

An account is given of one of the few studies made of the annual fall of litter in northern European woods. Data were collected over a period of 2–6 years on the amount, character and chemical composition of the annual litter produced in three lowland stands (35–80 years old) and three highland (800 m. elevation) stands (100–200 years old). The lowland stands were of Spruce and Birch and the highland stands of Pine, Spruce and Birch.

The dry weight of litter falling in the course of a year (from trees only—mostly needles and leaves) ranged from 0·6–0·9 metric tons per ha. for highland Pine to 1·9–3·3 metric tons per ha. for lowland Spruce. Spruce needles fell mostly in the driest summer months.

The relation in terms of dry weight between annual wood increment and annual litter-fall varied considerably as between the lowland and highland stands. Data for litter production as a percentage of increment are as follows:—

Elevation m.	*Norway Spruce*	*Birch*
80	43	56
180	47	—
800	90	178

The dry weight of needles or leaves required to produce annually a unit of dry wood was computed to be:—

Stand	*Norway Spruce*	*Birch*
Lowland	2·5	0·38
Highland	5·0	1·4

The litter was analysed for Ca, K, P, and N. The contents varied considerably at different times in the same stand due to the fact that the falling leaves or needles were not always in the same condition. A comparison of Spruce and Birch litter from the same stands showed the former to be always richer in lime and a little poorer in potash, while nitrogen and phosphorus contents showed no consistent differences. This is opposed to prevailing ideas although in agreement with older data. It is emphasized that Pine alone (not conifers as a group) stands isolated among northern forest trees in the production of a litter poor in both minerals and nitrogen; the 'soil-improving' value of Birch as compared with that of Spruce is questioned.

In the final chapter the writer discusses the influence of forest treatment on site quality. This will be improved by regular thinnings mainly because of the additional nitrogen that will be made available from the green needles left on the forest floor. Under conditions of raw humus it is important to use a method of clear-felling in order to increase the ground temperature and thus bring about conditions more favourable to the decomposition of the humus and the release of mineral nutrients. Finn Frost.

11.47. Maintenance of Favourable Soil Conditions

11.47.1 : 23.26.4 : 12.25. Heit, C. E. **Fertilizers for coniferous seedlings and transplants.** *N.Y. Nursery Notes* No. 12, 1942 (4–5).

The aims of soil management should be:—(1) to improve the texture of the soil and maintain general fertility, and (2) to supply nutrients to the growing stock by the direct application of fertilizers. Materials suitable for each purpose are suggested. Peat moss is particularly recommended for the seedbed area. Little benefit will result from the application of commercial fertilizer during the first year when the general fertility of the soil is normal, but the application at the beginning of the second year of a fertilizer such as the common 5–10–5 fertilizer, castor pomace, cotton-seed meal, or other fertilizer containing a high percentage of nitrogen, will result in improved growth and vigour.

11.47.6 : 13.15 : 13.2. Adamson, A. M. **Termites and the fertility of soils.** *Trop. Agric.* 20, 1943 (107–12). [Imperial College of Tropical Agriculture, Trinidad.]

A discussion on the mode of life and feeding habits of termites with particular reference to the probable effect of their activities on the fertility of the soil. In their relations to the soil, termites fall into two groups:—(1) the so-called dry-wood termites of the family Kalotermitidae which live almost exclusively within dead wood, and (2) the soil-dwellers of the families Mastotermitidae, Hodotermitidae (excluding the subfamily Termopsinae), Rhinotermitidae and Termitidae. Very few species of the first group enter the soil at all, and these to an insignificant extent, but the consumption and disintegration of dead wood by these termites may be of some importance, especially as most species attack wood as soon as it dies and are thus among the first agents of decay. The colonies of the Kalotermitidae are, however, relatively small and their activities in the tropics are generally of minor importance in comparison with those of other termites.

Although many of the soil-dwelling termites feed and build nests above ground, the greater part of their lives is spent in intimate contact with the soil. They may be subdivided into the following groups:—(*a*) exclusively subterranean termites which live in nests and passages underground and come to the surface only during the brief nuptial flight; (*b*) builders of exposed nests (termitaria); and (*c*) termites that live in subterranean nests but that seek food above the surface, often by way of covered passages. The last group includes most of the termites responsible for damage to buildings, especially those of the genera *Coptotermes*, *Heterotermes* and *Reticulitermes*.

The diet of termites varies with the species, but seems generally to consist of cellulose, which is most commonly obtained from decayed plant remains. Living wood is attacked by relatively few termites, and

no termite is known to be entirely dependent on this class of food. Probably in most cases the attack begins on dead tissues from which the living wood is invaded, Harvester termites, mostly of the genus *Hodotermes*, feed on blades of living grass. Sound dead wood is the chief diet of the Kalotermitidae, Rhinotermitidae and many of the Termitidae. Rotting wood is subject to attack by most termites, especially the Termitidae. Dead organic matter and humus also serve as food for some species. Examination of the contents of the alimentary canal of certain Trinidad termites showed that in many cases soil was an important part of the diet. Fungi from the 'fungus gardens' of some species are also eaten. There is little information to indicate what materials are returned to the soil.

Soil mixed with varying amounts of organic matter is the principal building material used by the termites in the construction of covered runways and nests, and in the lining of their galleries in wood. Some species are said to use only saliva as a cement but the use of faeces is probably more general. There are conflicting reports on the relative fertility of abandoned termite mounds, some being more fertile, some less fertile than the surrounding soil. The activities of termites may influence soil fertility in the following ways:—(1) By promoting the disintegration of vegetable remains, the formation of humus is accelerated. On the other hand, the organic content of the soil may be reduced, especially in dry areas of sparse vegetation, by the consumption of vegetable remains which would eventually form humus. (2) With the exception of fixed nitrogen all essential mineral elements are probably returned to earth. The termites may thus play an important part in the cycle of nutrient elements in the soil. (3) Calcium carbonate may accumulate in the mounds at the expense of the surrounding soil. (4) Soil structure is probably improved, especially by the admixture of the soil with humus. (5) Burrowing may greatly facilitate soil aeration. (6) Increased drainage may reduce runoff after heavy rain. (7) Subterranean tunnels may facilitate root penetration in compact soils. (8) Soil carried to tree trunks and branches may favour the growth of certain epiphytes. (9) The grass-collecting activities of the harvester species, as in the African velds, may result in soil erosion in the vicinity of the nests.

11.48. Soil Classes according to their Basic Material

11.48 (47.1) : 12.19.2. AALTONEN, V. T. **The Finnish forest soils according to the second forest survey in Finland.** *Commun. Inst. for. Fenn.* 29 (5), 1941 (1–71). [Finn.g.] S.P.S.

In conjunction with a strip survey of forest types, data were taken on soil class, depth of humus layer and of the leached (A) horizon in the mineral soil. Broad correlations that were found between forest type and soil class are discussed with illustrations. Pine and the poorer forest types were found to occur slightly more often on the coarser soils.

11.48–9 (56.9) : 12.19. ZOHARY, M. **The vegetational aspect of Palestine soils: a preliminary account of the relations between vegetation and soils in Palestine.** *Palestine J. Bot.* [*Jer. Ser.*] 2, 1942 (200–46).

A review of the most common soil types of Palestine in relation to their vegetational cover. In a country such as Palestine where the vegetation is generally subjected to arid and semi-arid conditions, the principal soil factors which decide the character and composition of the vegetation are those conditioning the water regime. Next in importance is the amount of organic matter and of certain soluble salts. These are the factors taken into consideration in the grouping of the soils in the present study.

Following introductory notes on the orographical, climatic, and phytogeographical relations of the country, the author deals with the soil/vegetational relationships in Palestine under the following main headings:—calcareous soils; basalt soils; sandy and sandy-calcareous soils; loess soils; alluvial soils; and saline soils.

11.49. Soil Types

11.49.0 (47.1) : 11.41.8 : 11.42. AALTONEN, V. T. **The stratigraphy of podsol, III: Moor-type woods.** *Commun. Inst. for. Fenn.* 29 (7), 1941 (1–43). [G.] S.P.S.

This is the concluding part of the series. The distribution and composition of the Al–Fe–Si colloidal complex in the upper 18 in. or more of the profile were studied using Tamm's oxalate method. Other determinations made include contents of organic matter, lime (by 10-per-cent. HCl), exchangeable bases, base-mineral index (Tamm), electrolytes (by conductivity of a suspension), and pH (in water, KCl, Na_2SO_4, and oxalic acid). The profiles studied were mostly humus podsols (Tamm). They gave much the same picture as did the drier podsols treated in the earlier parts of the series. The maximum of precipitated SiO_2 was on the average found at a greater depth than were the maxima of sesquioxides. In young soils, iron oxide tended to reach its maximum at a lower soil level than did aluminium; the reverse was found in older soils. Exchangeable bases were low throughout and mostly followed the content of organic matter. It is maintained that the steady loss of lime due to leaching can be effectively counteracted only by liming. [Cf. *For. Abstr.* 2 (281).]

11.6. *Hydrographical Conditions. Water and Soil Conservation*

11.62 (78 : 79.1–4) : 91.3 : 97.1 : 60.32. CONNAUGHTON, C. A. **Yield of water as an element in multiple use of wild land.** *J. For.* 41, 1943 (641–4). [Rocky Mt. Forest and Range Exp. Sta.]

11.62.1 (54) : 97.1. PRASAD, J. **Land use and erosion.** *Indian For. Leafl.* (*Silviculture*) No. 38, 1943. pp. 9. [Forest Research Institute, Dehra Dun.]

A non-technical account of land erosion in India, dealing with the nature and causes of erosion and with measures for its prevention and control, including proper land planning.

11.62.1 (942) : 61.4. TAYLOR, J. K., and STEPHENS, C. G. **Note on the mapping of soil erosion.** *Repr.* from *J. Coun. sci. industr. Res. Aust.* 16 (1), 1943 (33–6 + plate).

With particular reference to the mapping of soil erosion in Victoria County, South Australia. Notes are given on erosion classes and field characteristics. It is pointed out that in this work aerial photographs are essential for accuracy and speed in mapping erosion.

11.62.11 (54.5) : 23.3. WADHWANI, B. B. **September operations in the *kachos* in Sind.** *Indian For.* 69, 1943 (196–200).

The *kachos* are alluvial formations of sand or clay

deposited by the River Indus during the annual floods, at which time the river commonly changes its course, eroding one bank and depositing material on the opposite bank. In the first year of formation the *kachos* are low and unfit for forest operations, and broadcasting of cereals is usually undertaken in suitable areas as soon as the water recedes. Cereal cultivation is repeated in the second and subsequent years if the area remains low, but within 2–3 years the annual deposit usually raises the level sufficiently to make possible forest operations. The grasses which first invade the area provide fodder for cattle while they are young and succulent, but subsequently they become a great hindrance to the growth of Babul (*Acacia arabica*) and must be suppressed. Tamarisk is generally undesirable, although it makes a suitable nurse for Babul in the early stages of development.

The broadcast sowing of *A. arabica* begins about the last week in August, as soon as the floods begin to recede. Germination commences a week or so after the water has left the area, and is generally profuse but irregular. Blanks are filled as soon as the ground is dry enough to withstand the weight of men and oxen. It is advisable that all sowing operations should be completed by the end of September as seedlings from sowings made after mid-October have less chance of survival.

It is very important that the *kachos* should be fully afforested as soon as possible, as once the alluvial area is beyond the reach of the normal floods growth is confined to plants that are able to survive on subsoil moisture and the scanty Sind rainfall.

11.62.11 (729.5) : 61 : 38.8. **Soil conservation in Puerto Rico and the Virgin Islands of the United States.** *Handbook U.S. Dep. Agric. Soil Conserv. Serv.* (*Region* 2). 1941. pp. 141.

11.62.11 (74.7). GUSTAFSON, A. F. **The control of soil erosion in New York.** *Ext. Bull. Cornell Univ.* No. 438, 1940. pp. 38.

11.62.11 (78.9 : 79.1) : 11.62.31 : 23.21 : 23.24 : 38.8. KNAPP, K. H., and LIBBY, J. A. **Erosion of stream banks, its prevention and correction.** With appendices. *Reg. Bull. U.S. Soil Conserv. Serv.* No. 78, 1942. pp. 32 + plates + 5 + plate + 8 + 13.

This bulletin is concerned with the problem of channel erosion and its control, particularly in the Southwest Region of the United States, with the basic principles underlying the problem, and with engineering practices and designs and vegetative measures that may be used in stream-bank protection. Vegetative control is discussed with reference to location and type of plantings, selection of species, type of planting stock (cuttings or transplants), and method of planting. The appendices are:—(1) 'Flood protection in narrow valleys' by W. B. Wroth; (2) 'Erosion of stream banks' by L. B. Smith; (3) 'Theory and practice in the design of permeable jetties' by C. R. van Orman.

12. FOREST BOTANY. TREE SPECIES

12 (97) : 90. SYMINGTON, C. F. **The future of colonial forest botany.** *Emp. For. J.* 22, 1943 (11–23).

A statement is made of the basic botanical requirements of foresters which, it is shown, have not been adequately met in the past. Causes of failures are sought with a view to dealing with the problem more satisfactorily in the future, and it is shown that the crux of the matter is collaboration between botanists and field biologists in the solution of a colonial problem. It is stated that unilateral attempts at solution would be fatal, but a constructive plan is outlined to provide the basis for discussion and to stimulate interest.

The plan involves admission of the necessity for the production of 'Field Floras' *in situ* and not in European herbaria, and provision of the necessary field botanists by recruiting them into Colonial Forest Service. This plan is drawn up in the interests of field biologists as a whole, but it has certain obvious advantages to colonial foresters, and these are detailed.

The opinion is expressed that the time was never more opportune for rationalization of Colonial forest botany. But agreement among foresters is only the first step; it must be followed by understanding with the botanists, and, finally, a joint approach must be made to those who are in a position to grant a charter which will make it possible to put into operation a rational long-term policy. *From author's summary.*

12.1. *General Botany*

12.11. Physiology. Reproduction. Growth

12.11 : 07.2. KRAMER, P. J. **Some problems and possibilities in forest tree physiology.** *Chron. bot.* 7, 1943 (296–7). O.B.D.

Stress is laid on the great need for research on almost every phase of tree physiology, not only from a purely scientific point of view, but in order to help in the development of sound silvicultural practices. The results of such practices are dependent on changes in the internal processes of the tree brought about by the artificially-produced change of environment, and a knowledge of the physiological modifications involved would enable workers to judge more accurately the probable efficacy of such treatments as thinning and pruning on different species and in different localities. The advantages of using woody plants as experimental material have not been generally recognized. Although work on large trees out-of-doors presents certain difficulties, much work can be done with potted seedlings in the greenhouse or laboratory. Certain physiological problems requiring investigation are indicated. [See also *J. For.* 41, 1943 (682–3).]

12.11.1. *Metabolism. Plant Constituents. Sap Flow. Growth Substances. Reserve Materials.*

12.11.11 : 01.4. PARKS, R. Q., HOOD, S. L., HURWITZ, C., and ELLIS, G. H. **Quantitative chemical micro-determination of twelve elements in plant tissue: a systematic procedure.** *Industr. Engng. Chem.* (*Anal. Ed.*) 15, 1943 (527–33). [U.S. Plant, Soil, Nutrition Laboratory, Ithaca, N.Y.] P.R.

A systematic procedure of analysis is presented for the quantitative chemical micro-determination of twelve nutritionally important elements on single samples of plant tissue. The elements determined are calcium, magnesium, potassium, sodium, phosphorus, sulphur, iron, zinc, copper, manganese, molybdenum, and cobalt. Data are presented supporting the validity of the separatory procedures and analytical methods used, and their arrangement into a scheme of systematic analysis. *Authors' summary.*

12.11.11 : 07.7. COMAR, C. L., BENNE, E. J., and BUTEYN, E. K. **Calibration of a photoelectric colorimeter for the determination of chlorophyll: relation**

between spectra of standards and accuracy of analytical results. *Industr. Engng. Chem.* (*Anal. Ed.*) 15, 1943 (524–6). [Michigan Agricultural Exp. Sta.] L.S.

12.11.11 : 12.14.7 : 12.26–8 : 34.26. PELANDA PONCE, L. Contribución al estudio de la esencia de flores de *Eucalyptus globulus* del bosque de la Plata. **[The essence of flowers of *Eucalyptus globulus* from La Plata forest.]** *Rev. Fac. Cienc. Univ. La Plata* 15, 1940 (195–207). [U. Nacion, La Plata, Argentina.] Biol. Abstr. 17 (19135).

A study of composition and physical constants of this essence compared with known data.

12.11.12 : 11.43.1 : 12.25 : 56 : 12.11.13. ROUTIEN, J. B., and DAWSON, R. F. **Some interrelationships of growth, salt absorption, respiration, and mycorrhizal development in *Pinus echinata* Mill.** *Amer. J. Bot.* 30, 1943 (440–51). [Princeton University, New Jersey.] O.B.D.

The growth and salt absorption of seedlings of *Pinus echinata* Mill. have been investigated under conditions of controlled supply and availability of soil-borne nutrients in the presence and in the absence of mychorrhizae.

The respiration and fermentation rates of excised segments of mycorrhizal and non-mycorrhizal roots have been measured and compared.

It was found that substantial growth and salt uptake were possible at the higher levels of base saturation of the soil in the absence of mycorrhizae, provided that the physiological balance of the soil nutrients was maintained.

Development of mycorrhizae enabled the plants to continue normal growth and salt absorption or even to surpass the normal rates in the presence of considerable amounts of absorbed hydrogen ion (up to 37 per cent. of the total base exchange capacity of the soil colloids), while the lack of mycorrhizae under these conditions usually depressed growth and salt uptake.

Development of mycorrhizae increased the average rate of aerobic carbon dioxide production of each short root from nearly two to four times the normal amount depending upon the degree of such development.

A mechanism for fermentation was introduced with mycorrhiza formation which exhibited a definite oxygen inhibition and, therefore, served to stabilize the rate of carbon dioxide production by the short roots regardless of oxygen supply.

It is suggested, on the basis of these observations, that mycorrhizae increase the salt absorbing capacity of the roots primarily by adding to the supply of exchangeable hydrogen ion derived in part at least from carbonic acid. The increased salt uptake may then be reflected in a greater rate of growth. *Authors' summary.*

12.11.13 : 12.14.2 : 12.26–8. PLANTEFOL, L., and GAUTHERET, R. **Extent of changes in respiration of plant tissues in culture solution. Original and newly-formed tissues.** *Compt. rend.* No. 213, 1941 (627–9). *Chem. Zbl.* 1942, I (2414). Chem. Abstr. 37 (4097). P.R.

In experiments with the cambium of *Salix caprea* the respiratory rate was higher in the newly-formed tissue.

12.11.14 : 12.25 : 12.26–8. KOZLOWSKI, T. T. **Transpiration rates of some forest tree species during the dormant season.** *Plant Physiol.* 18, 1943 (252–60). [Duke University, Durham, North Carolina.] O.B.D.

An investigation was made of the absolute transpiration rates of Loblolly Pine, Eastern White Pine, Cherry Laurel (*Prunus laurocerasus*), White Oak, Yellow Poplar and Sugar Maple during the dormant season of 1940–41. No great difference was observed in foliar transpiration of conifers and stem transpiration of deciduous species on a unit area basis.

The average transpiration rate of Loblolly Pine and Cherry Laurel for October–November was more than twice the average maximum transpiration for December and January; in the case of White Pine the average rate for October–November was more than three times the December–January maximum.

Highly significant differences in transpiration rates, on a unit area basis, were indicated in comparisons between broadleaved evergreen and deciduous species and between Pines and Cherry Laurel. During December and January the weekly transpiration rates of Cherry Laurel were approximately 2–4 times as great as those of either of the two species of Pine. Comparisons of the transpiration rates during the dormant season of Loblolly Pine and Eastern White Pine, and White Oak, Yellow Poplar and Sugar Maple showed no real statistical differences.

A decrease in soil temperature was found to decrease the transpiration rates of Loblolly and Eastern White Pine. This is in general agreement with results obtained from other investigations with herbaceous materials. Transpiration of Loblolly Pine was reduced more than that of Eastern White Pine over the temperature range between 17° and 0° C. The difference in behaviour of the two species is probably caused by differences in inherent protoplasmic qualities. The greater reduction in absorption by Loblolly Pine in cold soil might be a factor in its inability to survive in colder regions. *From author's summary.*

12.11.15 : 23.26.3 : 12.25. FOWELLS, H. A. **The effect of certain growth substances on root-pruned Ponderosa Pine seedlings.** *J. For.* 41, 1943 (685–6). [California Forest and Range Exp. Sta., Berkeley, Calif.]

The roots of selected seedlings, pruned to a length of 6 in., were immersed for 24 hours in an aqueous solution of either indoleacetic acid or of vitamin B (three different concentrations of each—5, 25, or 50 parts per million), or in distilled water. There were thus seven treatments. Half the seedlings were planted in soil and half in a complete nutrient solution. Under the conditions of this experiment indoleacetic acid was relatively ineffective in promoting root initiation, and, in general, vitamin B had little effect on the growth of roots or tops.

12.11.2. *Propagation. Growth. Development*

12.11.21 : 12.14.7 : 12.26–8 : 12.11.3. SAARNLJOKI, S. **Experiments on the germination of the pollen of forest trees.** *Commun. Inst. for. Fenn.* 29 (3), 1941 (1–15). [G.] S.P.S.

The viability of pollen of Aspen, Hazel, two species of *Alnus*, eight of *Betula* and five of *Salix* (not counting hybrids) was tested and the following information was obtained:—(*a*) Pollen should be collected as late as possible, just before the catkins open; (*b*) if pollen has been stored at room temperature for 2–3 weeks, very large amounts will be needed for successful pollination; (*c*) pollen in catkins deteriorates with exposure to room temperature and to stimuli used for hastening development; (*d*) pollen should be carefully protected from

moisture, and pollination work in the open should be done only in dry weather.

12.11.22 : 12.11.15 : 12.26–8. McKee, R. H. (Assr. to McKee Poplar Forestation, Inc.). **Propagation of trees from cuttings.** *U.S. Patent* No. 2,274,989, March 3, 1942. Brit. chem. physiol. Abstr. BIII, 1943 (175). P.R.

In order to stimulate root formation, cuttings of hybrid Poplars are placed, prior to planting, in an aqueous solution of a hormone, e.g. phenyl- or xylyl-stearic acid or salt thereof, and the upper portions are waterproofed by dipping in molten paraffin wax, m.p. > 50°.

12.11.23 : 12.25–8 (75.6) : 56. Kramer, P. J. **Amount and duration of growth of various species of tree seedlings.** *Plant Physiol.* 18, 1943 (239–51). [Duke University.] O.B.D.

Measurements were made of the length of growing season and the amount of growth made by tree seedlings of 11 different species in North Carolina, some of which were growing outside their natural range. The species used were Balsam Fir (*Abies balsamea*), Loblolly Pine (*Pinus taeda*), Shortleaf Pine (*P. echinata*), Slash Pine (*P. caribaea*), Red Pine (*P. resinosa*), White Pine (*P. strobus*), White Ash (*Fraxinus americana*), Eastern Red Oak (*Quercus borealis maxima*), White Oak (*Q. alba*), Yellow Poplar (*Liriodendron tulipifera*) and Black Walnut (*Juglans nigra*).

Of the hardwoods, White Ash and Yellow Poplar grew most rapidly, while Loblolly Pine made the fastest growth among the conifers. The northern species (Red and White Pine and Balsam Fir) made only one-sixth of the growth of Loblolly Pine.

Considerable differences were noted between the species with respect to the length of the growing season and the time of maximum growth. All species resumed growth in late March or early April. The average length of the growing season and the date by which growth is suspended are shown in the following table for 10 species:—

Species	*Length of growing season*	*Suspension of growth*
White Ash, Eastern Red Oak, White Oak, Black Walnut	130–135 days.	July or early August.
Yellow Poplar ..	160 days.	September.
Loblolly Pine, Shortleaf Pine, Slash Pine..	200 days or more.	October.
Red Pine .., White Pine	120–145 days.	July or August.

Several species made more than 50 per cent. of their growth before May 1st. In many cases growth is suspended long before the first frosts of autumn, only one-half to three-quarters of the frost-free season being utilized for growth.

12.11.3. *Heredity. Breeding. Hybridization. Races and Questions of Provenance*

12.11.3 (485) : 12.25 : 12.26–8. Sylvén, N. Växtförädling och rationell skogsdrift. **[Plant breeding and rational management of forests.]** *Skogen* 29, 1942 (347–9). [Sw.]

Tree breeding will play an important part in the future of Sweden's forests and of their economic utilization. Reference is made to some of the results that have been obtained by the Forest Tree Breeding Association.

Seed trees of Scots Pine should be the small-crowned and fine-branched individuals, while those of Norway Spruce should be of the comb type. The percentage of 'comb' Spruce in stands of south and central Sweden is frequently 50 or higher.

Among broadleaved trees Birch is of first importance in any question of rational management based on tree breeding. The relatively short reproductive cycle of this species makes it easier to work with than the conifers. Recently, much attention has been given to the Grey Birch, a type characterized by the dark brown or greyish colour of its bark. Its wood is particularly suitable for veneer. R. P. J.

12.11.3 : 12.25 : 07.2. Petrini, S. De internationella tallproveniensförsöken av år 1907. **[The international provenance experiments with Pine of the year 1907.]** *Medd. Skogsförsöksanst. Stockh.* 33, 1942 (247–66) [Sw.g.] S.P.S.

The first international provenance experiments with Scots Pine (*Pinus sylvestris*) were started in 1907. The series included twelve different provenances:—Scotland, France, East Prussia, Belgium, Bavaria, Kurland, Brandenburg, Russia (Ural), Bulgaria, North Hungary, West Hungary, and Sweden (Lapland). The series was planted at 18 different places and at least two-thirds of the plots have since been destroyed. The Swedish plot is located at lat. 57° 38′N., long. 15° 37′E. The soil is ordinary moraine. In this locality the Kurland (Riga) Pine has given best results both as regards volume production and timber quality (straightness, size of branches and knots). Next comes the Scottish provenance (Inverness, 57°14′N., 3°42′W.). The Swedish Pine from the northernmost part of the country, here growing in southern Sweden, is in fourth place after the East Prussian provenance. Of the remainder, the Pines from Bulgaria and Russia (Ural) are of excellent quality though their volume production is less than average.

12.11.3 : 12.26–8 : 12.11.22. Kulikov, A. I. **A vegetative hybrid of Mountain Ash.** *Plod. jagodn. Kultury* No. 3, 1940 (85). [R.] Hort. Abstr. 13 (721).

In 1932 the author grafted scions of 3-year-old *Sorbus melanocarpa* into the crown of an 8-year-old fruit-bearing *Sorbus aucuparia*; in the spring of 1935 scions from the 1932 graft were similarly used on the same tree. The grafts reached the fruit-bearing stage in 1935 and 1939 respectively, but whereas the 1932 hybrids gave fruit and had leaves similar to *Sorbus melanocarpa* those of the 1935 hybrids resembled *Sorbus aucuparia*. Further observations on the inevitability of the above changes are promised in a future communication.

12.11.3 : 12.26–8. Perry, B. A. **Chromosome number and phylogenetic relationships in the Euphorbiaceae.** *Amer. J. Bot.* 30, 1943 (527–43). [University of Virginia, Boyce, Va.] O.B.D.

Chromosome numbers have been determined for 109 species and varieties from 22 genera of the Euphorbiaceae. Chromosome numbers for 90 species and varieties, representing 19 genera, are reported for the first time. The basic numbers for the family are 6, 7, 8, 9,

10 and 11, with 8 as the probable primary basic number. Aneuploidy and polyploidy have both been effective in speciation within the family, the frequency of polyploidy being about 50 per cent. Polyploidy is relatively infrequent in annuals as contrasted with perennials, which were found to have, on the average, higher chromosome numbers than the annuals.

12.11.3 : 12.26–8. SMITH, E. C. **A study of cytology and speciation in the genus *Populus* L.** *J. Arnold Arbor.* 24, 1943 (275–305 + plates). [Biological Laboratories, Harvard University.]

An investigation embracing 45 species, varieties, and natural hybrids of the genus *Populus* with particular reference to chromosome numbers and chromosome behaviour in pure species and interspecific hybrids, and to speciation within the genus. Of the species, varieties, and natural hybrids examined with respect to chromosome numbers, all existed in the diploid form, with the diploid number of chromosomes equal to 38. Three species were found to possess triploid forms also, with an unreduced chromosome number of 57. It is possible that the examination of an individual species throughout its range might also reveal polyploidy within that species. Polyploid forms of *P. tremula* have been produced by different investigators. Although the study of sex-chromosomes was not part of the investigation, it was noted that no definitely heteromorphic chromosome pair was found consistently in any of the species and hybrids studied. Evidence is given that *Populus* is a secondary polyphoid, but although the genus appears to be of polyploid origin, more detailed study is necessary before the actual basic number can be determined with certainty.

Chromosome pairing was complete in most of the pure species studied, but there was a fairly wide variation in pollen sterility, those species which showed some univalent chromosomes being generally the most sterile. Nevertheless, univalent frequency does not seem to be sufficient in itself to account for the sterility encountered, and it is probable that genetic and environmental factors are also involved.

About 25 natural interspecific hybrids have been reported within the genus *Populus*, but artificial interspecific hybrids have been produced in abundance by various workers. The most probable reason for the comparative scarcity of natural hybrids is that, while growing in the same general geographic region, the parent species may occupy different ecological habitats and thus overlap rather infrequently. The cytology of hybrids is discussed in detail.

12.12. Teratology

12.12 : 44.3 : 12.26–8. HINTIKKA, T. J. Über die Verbänderungen und Hexenbesen an der Traubenkirsche (*Prunus padus* L.). **[On the fasciations and witches' brooms on the Bird Cherry (*Prunus padus* L.).]** *Acta for. fenn.* 45, 1939 (1–154). [G.finn.] S.P.S.

The author refers for the first time to findings of fasciations on the Bird Cherry (*Prunus padus*) and describes their anatomy and morphology. They are classified as a pathological development. A detailed description is given of studies of witches' brooms on *P. padus* in Finnland. Parasitic mycelia were found in some cases, but probably not belonging to *Taphrina cerasi*, which causes witches' brooms on *P. cerasus*. In other cases the brooms depend on non-parasitic agencies and the author considers them to be due to abnormalities in bud development.

12.14. Organography. Morphology. Anatomy. Histology

12.14.4 : 12.25 : 12.11.23 : 12.11.12. CRAFTS, A. S. **Vascular differentiation in the shoot apices of ten coniferous species.** *Amer. J. Bot.* 30, 1943 (382–93). [University of California, Davis, Calif.] O.B.D.

Studies on ten additional coniferous species [*Cedrus atlantica, C. deodara, Cupressus arizonica, Juniperus horizontalis, Libocedrus decurrens, Pinus halepensis, Pseudotsuga taxifolia, Sequoia gigantea, Taxodium distichum*, and *Torreya californica*] confirm the previous findings on *Sequoia sempervirens* [cf. *For. Abstr.* 5 (97)]. Xylem differentiation in the shoot apex is intermittent and once initiated proceeds both acropetally and basipetally. Phloem and procambium differentiation are apparently continuous and acropetal.

A number of types of phyllotaxis were found, including decussate, whorled, and spiral. Of the spiral type examples of $\frac{2}{5}$, $\frac{3}{8}$, and $\frac{5}{14}$ were studied.

The protophloem-procambium system seems adequate to conduct both organic and inorganic nutrients, hormones, and other accessory growth factors to the apical meristems of coniferous plants, providing the conditions found in these eleven species are general for the group as a whole. *Author's summary.*

12.14.4 : 12.25 : 12.11.23. KEMP, M. **Morphological and ontogenetic studies on *Torreya californica* Torr. I. The vegetative apex of the megasporangiate tree.** *Amer. J. Bot.* 30, 1943 (504–17). [Smith College, Northampton, Mass.] O.B.D.

This paper describes the results of a study of the vegetative apex of the megasporangiate trees in *Torreya californica*. The material consisted of terminal buds from twigs of approximately the same size and age, collected at bimonthly intervals throughout the year and prepared according to a special schedule.

The size and ratio of height to diameter, together with the cellular organization of the apical meristem indicate similarities with all members of the Coniferales so far investigated, with closest resemblances to *Taxus*, *Abies*, and *Cunninghamia*. *From author's summary.*

12.14.4 : 12.29. CHEADLE, V. I. **Vessel specialization in the late metaxylem of the various organs in the Monocotyledoneae.** *Amer. J. Bot.* 30, 1943 (484–90). [Rhode Island State College, Kingston, Rhode Island.] O.B.D.

12.14.4 : 12.29. CHEADLE, V. I. **The origin and certain trends of specialization of the vessel in the Monocotyledoneae.** *Amer. J. Bot.* 30, 1943 (11–7). O.B.D.

12.14.5. WYLIE, R. B. **The role of the epidermis in foliar organization and its relations to the minor venation.** *Amer. J. Bot.* 30, 1943 (273–80). [University of Iowa, Iowa City, Iowa.] O.B.D.

In this paper some of the relations between the epidermal tissue and other parts of the leaf blade of mesomorphic plants, both woody and herbaceous, are examined, special attention being given to the areas between the veins. While it is generally recognized that the epidermal layers act as a protective covering for the interior tissues, the structural and mechanical importance of these layers in the maintenance of the lamina between veins and in the support of the mesophyll has not been adequately stressed. Attention is also drawn to the rôle of the epidermis as a supplementary conductive system in mesomorphic leaves.

12.14.5 : 12.25 : 12.11.23. STONE, E. L., and STONE, M. H. **Dormant buds in certain species of *Pinus*.** *Amer. J. Bot.* 30, 1943 (346–51). [Cornell University, Ithaca, N.Y.] O.B.D.

The origin and development of stem sprouts in *Pinus rigida* and *P. palustris* are described. These sprouts arise from small buds at the intermediate nodes of multinodal stems, as well as from small lateral buds at the winter nodes, which may remain more or less dormant for a few years. Usually these buds become short branches of limited development, bearing isolated or few fascicles, but they are capable of forming normal long branches following injury to the tree. In *P. rigida* the branches of limited development give rise to lateral buds which often remain dormant for a considerable time in the bark of the parent stem.

It is suggested that stem sprouts in certain other multinodal Pines, *P. rigida* var. *serotina*, *P. echinata*, *P. leiophylla*, *P. pungens*, and *P. sabiniana* have, in general, a similar origin and development. *Authors' summary.*

12.14.5 : 12.26–8 : 12.11.1 : 42.21 : 56.02. KRAMER, P. J., and WETMORE, T. H. **Effects of defoliation on cold resistance and diameter growth of broad-leaved evergreens.** *Amer. J. Bot.* 30, 1943 (428–31). O.B.D.

The effects of defoliation on the cold resistance of six species of broad-leaved evergreens were studied for three years. The species used were *Camellia japonica* L., *Prunus laurocerasus* L., *Elaeagnus pungens* Thunb., [*Ligustrum japonicum* Thunb.], *L. lucidum* Ait., and *Osmanthus aquifolium* Sieb.

Eight plants of each species were defoliated in October, eight were defoliated in April and eight were left undefoliated as controls. The autumn-defoliated plants were mostly killed, the few surviving plants being in very poor condition, except for three *Elaeagnus* which survived two successive autumn defoliations in good condition. Spring-defoliated plants survived the following winter in excellent condition, but three of the four species made significantly less diameter growth than the controls.

Autumn defoliation of broad-leaved evergreens apparently greatly increases their susceptibility to cold injury, probably because they are partly dependent on the leaves for carbohydrates during the winter. Removal of the old leaves in the spring significantly reduced diameter growth in three of four species investigated, indicating that the old leaves contribute considerable carbohydrate to the plants during their second summer. *Authors' summary.*

12.14.7 : 12.26–8. JOSHI, A. C. **Structure of the gynoecium in male flowers of *Osmanthus suavis* King.** *J. Indian bot. Soc.* 21, 1942 (331–7). [Benares Hindu University.] O.B.D.

12.14.7 : 12.25 : 12.19. CARROLL, G. **The use of bryophytic polsters and mats in the study of recent pollen deposition.** *Amer. J. Bot.* 30, 1943 (361–6). [University of Tennessee, Knoxville, Tenn.] O.B.D.

A study was made of the modern pollen rain in a Spruce/Fir forest, using bryophytic polsters and mats as the source of accumulated pollen grains; the pollen percentages obtained were compared with the composition of the surrounding forest:—(*a*) Pollen from several species foreign to the Spruce/Fir forest was present as a contamination which averaged 23 per cent. In some cases the source of this pollen was several miles distant and several thousand feet lower in elevation. (*b*) When the accumulated pollen of the dominant species of the Spruce/Fir forest was considered as 100 per cent. and compared with the basal area of the existing stand, it was found that Spruce was 15 per cent. under-represented, Fir was 5 per cent. over-represented, and Birch was 10 per cent. over-represented in the polsters. On a density basis, using only large trees (10 inches d.b.h. or over) Spruce and Fir percentages compare favorably with the pollen recovered, and Birch was somewhat over-represented. *From author's summary.*

12.14.7 : 12.26–8. BAILEY, I. W., and NAST, C. G. **The comparative morphology of the Winteraceae, I. Pollen and stamens.** *J. Arnold Arbor.* 24, 1943 (340–6 + plates). [Biological Laboratories, Harvard University.]

12.14.7 : 12.26–8. **A modern study of cauliflory.** *Nature, Lond.* 151, 1943 (481–2).

Reference is made to a typescript paper by Prof. J. McLean Thompson on cauliflory (the habit of flowering from buds borne upon the main branches and trunk) in the Carob (*Ceratonia siliqua* L.). It is clear from this paper that the Carob may bear male, female, and hermaphrodite flowers either simultaneously or successively on the same tree. Flowering always commences with the terminal bud. So long as this bud is vegetative, all lateral buds are vegetative also, but after the terminal bud becomes reproductive, flowering from lateral buds begins and continues downwards step by step. When the primary lateral inflorescences die back they are cut off from the stem by a layer of cork near the base of the inflorescence, leaving a short stump bearing dormant buds from which, in later seasons, secondary inflorescences may arise. The buds appear to be embedded in deep-seated pockets filled with a mucilaginous fluid which frees the newly-formed bud meristem from the surrounding tissues of the cortex.

12.19. Geographical Distribution. Plant Geography and Sociology

12.19 (212) : 12.25–8. SCHMUCKER, T. **The tree species of the northern temperate zone and their distribution.** *Silvae Orbis* No. 4, 1942. pp. 156 + maps. [F.G.E. Span.Ital.] [Université de Göttingue, Hannoversch-Münden.] F.D.E.

The purpose of this publication is to show, chiefly by means of 250 maps, the distribution of all the important tree species of the northern temperate zone. The areas of distribution have been remapped on the basis of the floristic and systematic literature available and are indicated by a linear representation of their limits ('border-line' method); as a rule no attempt has been made to indicate tracts within these areas in which the species is absent.

In the text a brief account is given of the method of selection and compilation used by the author, and of the area covered by the survey, and the general distribution of the north temperate tree species is outlined. The genera, and even the families, are, for the most part, types that are not represented in the tropics or that play only a very minor rôle in tropical regions. Relatively few genera representing tropical families have attained any significance in the flora of the temperate zone. Thirty-six such genera are named.

In spite of numerous and extensive zones of separation, the tree flora of the north temperate zone is

remarkably homogeneous, although certain important differences (mainly of species) do exist, as in the contrasting forest types of eastern and western North America. In diversity of types the temperate flora is greatly inferior to that of the tropics, but some of the tree genera (e.g. *Pinus*) have numerous species. The genus *Pinus* is unique in its wide distribution and its extensive formation of pure stands. The Oaks are next to the Pines in the extent of the area they cover.

In general, the distribution of species is dependent mainly on present-day climatic conditions. In any explanation of the limits of tree distribution three main determinants must be considered:—(1) Unusual or normally unimportant factors may exert a decisive influence in individual cases. (2) Temporary conditions obtaining during exceptional periods are just as effective in determining possibilities of life as are more permanent factors. (3) The competition of more vigorous species may prevent the establishment of a plant even in areas climatically suitable. In dealing with the distribution of individual species the influence of past history and the presence within an area of the same genetic unit must also be borne in mind.

Generally speaking, the relative richness and diversity of species in different parts of the world to-day is the result of geological factors. In many regions the varied flora of the tertiary period was forced to emigrate or was partially or completely destroyed during the glacial periods which followed. The most diverse flora now exists mainly in those parts of the world where damage was least severe or where conditions were favourable for immigration during the glacial periods.

12.19 (71) : 12.25 : 12.26–8. HALLIDAY, W. E. D., and BROWN, A. W. A. **The distribution of some important forest trees in Canada.** *Ecology* 24, 1943 (353–73).

This paper includes a series of maps showing diagrammatically the population intensity in Canada of certain tree species in relation to the mass of other tree species within their range. It is emphasized that the maps indicate only the relative, and not the actual, abundance of any species, and it is possible that in some cases an area of low actual abundance of a given species may show a high relative abundance owing to the scarcity of other species, as in the case of Spruce in the far north. The distribution and abundance of individual tree species is discussed in the text, and reference is made to the question of the re-invasion of the Canadian land-mass by forest flora during interglacial periods, in particular following the last or Wisconsin glaciation. The tree species treated in the maps are *Picea glauca*, *P. mariana*, *P. rubra*, *P. engelmanni*, *P. sitchensis*, *Pinus banksiana*, *P. contorta latifolia*, *Abies balsamea*, *A. lasiocarpa*, *A. amabilis*, *A. grandis*, *Tsuga heterophylla*, *Pseudotsuga taxifolia*, *Populus tremuloides*, *P. grandidentata*, *P. tacamahacca*, *P. trichocarpa*, *Betula papyrifera*, *B. populifolia* and *B. lutea*.

12.19. WILLIAMS, C. B. **Area and number of species.** *Nature, Lond.* 152, 1943 (264–7). [Rothamsted Experimental Station.]

A discussion, illustrated by a graphical diagram, of the relation between the area of a locality and the recorded number of species of flowering plants for that area. There is a particular lack of data for areas of between 2 acres and a square mile, and there are few records of small areas in the tropics and in subarctic and arctic climates. Moreover, it has been possible to obtain estimates of the total number of species constituting the flora of only two continents (North America and Europe).

The upper limit of the plotted points, which are scattered chiefly in a narrow belt across the graph, shows first a period of rapid rise from the smallest areas of a few square inches up to areas of about one hectare, following the expected increase in species due to the increase in the size of sample within a uniform population or within a single ecological association. Next there is a more steady rise, almost linear, lasting from about one hectare up to as much as 5 million square miles in the case of large continental land masses. This steady rise corresponds with the gradual inclusion in the sample of more and more ecological formations, due to changes in climate, soil, slope, or other differentiating factor. Finally, there is a very rapid increase in species from the continental areas to the whole land surface of the globe. This sudden increase in the number of species is due to the evolutionary origin of the floras, fewer species being common to two continents than to parts of the same continent.

From a diagram of this type it is possible to make rapid comparisons between dissimilar areas, taking into consideration not only the richness of the flora but also differences in the size of the area.

12.19 : 12.26–8 : 34.26. ARIAS, A. C. Estudios climatológicos: Areas geográficas de dispersión, *Parthenium argentatum*, *Hevea brasiliensis*, *Castilloa elastica*. **[Climatological studies: geographical areas of distribution for Guayule, Para and Castilla Rubber trees.]** México Sec. Agr. y Fomento. 1942. pp. 112. [Span.] E.S.R. 89 (288).

12.19.1. *Regional Floras*

12.19.1 (54.4) : 11.62.1 : 12.19.4. MOONEY, H. F. **A sketch of the flora of the Bailadila Range in Bastar State.** *Indian For. Rec. (n.s.) Botany* 3, 1942 (ii + 197–253 + maps + plates).

An account is given of the vegetation of the central fifteen miles or so of the Bailadila Range, a geographic and geologic unit situated in the south-central area of Bastar State, below the main plateau. At one time the higher valleys in the region were inhabited, and the upper slopes of the hills have been subjected to intensive shifting cultivation in comparatively recent times—probably within the last 50 or 60 years. Shifting cultivation ceased, however, some time before 1910, when the range was constituted a reserved forest. Exposure and erosion have in places so degraded the soil that much of the area now supports only a subclimax vegetation which tends to be perpetuated by annual fires in the dry season. Numbers of plants are killed every year along the periphery of the evergreen belt, and some of the existing woodlands (as in the Galli valley) are composed for the most part of fire-resistant species. The climax vegetation of the high valleys appears to be evergreen forest, and the author believes that fire protection would result in the re-establishment of closed forests in these regions.

The area as a whole is divided into 5 main types of habitat:—

(1) the outer slopes of the range;
(2) the upper slopes and crest of the range;
(3) the slopes of the central valleys (3,000–3,700 ft.);
(4) the central valley bottoms; and
(5) the lower valley (below 2,750 ft.).

The vegetation of each of these regions is discussed separately. Lists are given of plants according to their directional affinity, and the various species (including 102 tree species) are also listed, in groups, alphabetically, with an indication of their main habitat and relative frequency. Additional records collected by Dr. H. Crookshank are included in a separate section, and an appendix contains a list of the Madia and Halbi names of some of the plants recorded.

12.19.1 (59.6–9) : 12.26–8. Hui-Lin Li. **Notes on the flora of Indo-China.** *J. Arnold Arbor.* 24, 1943 (362–74). [Arnold Arboretum, Harvard University.]

This paper is based almost entirely on material collected from the extreme northeastern part of Tonkin, adjacent to the Kwangtung border, during the second, third, and fourth Lignan Indo-China Expeditions in 1936, 1939, and 1940.

Descriptions of the following new trees are included in the catalogue of species:—*Helicia tsangii, Reevesia macrocarpa, Madhuca tsangii, Rehderodendrom indochinense, Huodendron parvifolium, Symplocos indochinensis,* and *Olea cordatula.*

12.19.1 (72) : 12.26–8. Johnston, I. M. **Plants of Coahuila, eastern Chihuahua, and adjoining Zacatecas and Durango. I.** *J. Arnold Arbor.* 24, 1943 (306–39). [Arnold Arboretum, Harvard University.]

An enumeration and analysis of the vascular flora of the arid plateau which lies between the Eastern and Western Sierra Madre of northern Mexico. The present catalogue, which probably contains not more than 75 per cent. of the total vascular flora of the area, is based almost exclusively upon collections available at the Gray Herbarium and the Arnold Arboretum. The tree species included in the first paper are *Pinus cembroides, P. pinceana, P. ayacahuite, P. greggii, P. arizonica, Pseudotsuga taxifolia, Abies coahuilensis* sp. nov., *Taxodium mucronatum, Cupressus arizonica, Juniperus pachyphloea, J. flaccida, J. ashei,* and *J. monosperma.*

12.19.1 (72 : 728 : 76.4) : 12.26–8. Lundell, C. L., and Collaborators. **New vascular plants from Texas, Mexico, and Central America.** *Amer. Midl. Nat.* 29, 1943 (469–92). [University of Michigan, Ann Arbor, Mich.] L.S.

Among the new species listed in this paper are the following trees:—*Roupala repanda* Lundell, *Phoebe mayana* Lundell, *Erythroxylon multiflorum* Lundell, *Amanoa potamophila* Croizat, *Sapium schippii* Croizat, *Calyptranthes cuneifolia* Lundell, *Eugenia ardisioides* Lundell, *E. flavoviridis* Lundell, *E. mouririoides* Lundell, *E. oblanceifolia* Lundell, *Myrcia longicaudata* Lundell, *M. schippii* Lundell, *Ardisia glomerata* Lundell (probably a small tree), *A. wedelii* Lundell, and *Cordia belizensis* Lundell.

12.19.1 (728.1). Standley, P. C., and Steyermark, J. A. **The vegetation of Guatemala, a brief review.** *Chron. bot.* 7, 1943 (315–8). [Field Museum of Natural History, Chicago.] O.B.D.

The diverse geological history of Guatemala, its exceedingly varied types of soil, topography and climate have combined to give the country the richest flora in all Central America, with an estimated total of 8,000 species of vascular plants. The main floristic regions (some of which may be further subdivided) are as follows:— (1) The limestone plains of Petén; (2) the Mangrove swamps along both coasts; (3) the rain forest of the Atlantic coast; (4) the low savannas of Izabal and Petén; (5) the mixed forest of the Pacific plains; (6) the arid desert plains-chaparral of the plateaux of the Oriente and the valleys of the Río Motagua and Rio Blanco (Río Negro); (7) the wet mountain forest of Alta Verapaz; (8) the mixed mountain forest of the Pacific bocacosta; (9) the upland mixed forest of temperate and cold regions; (10) the coniferous forests; (11) the alpine regions.

Notes are given on the characteristic flora of each region.

12.19.1 (74.7). Goodwin, R. H. **The flora of Mendon Ponds Park.** *Proc. Rochester Acad. Sci.* 8, 1943 (233–98 + figs.) [University of Rochester.] L.S.

This paper consists of two main sections:—(1) a description of the physical and ecological features of the Mendon Ponds Park recreation area which is situated in the southeastern part of Monroe County, New York; and (2) an annotated list of the species and varieties of vascular plants found therein.

The remnants of the original vegetation are closely correlated with the topography of the land. Marshes, marsh meadows, bogs and bog forest occupy the low, poorly drained areas, while upland Oak and Beech/Maple woods occur chiefly on slopes too steep for agriculture. The most generally distributed vegetation type in the area is the upland Oak forest which occupies well-drained sands and gravels. Here *Quercus alba, Q. borealis* var. *maxima, Q. velutina,* and *Carya ovata* are the dominant trees. Associated trees are numerous and include other species of *Carya* and *Quercus,* as well as *Fraxinus americana, Acer rubrum, Prunus serotina, Sassafras albidum, Ostrya virginiana, Juglans cinerea, Ulmus fulva, Tilia americana, Liriodendron tulipifera, Castanea dentata* and various other smaller trees and shrubs.

Since the formation of the Park in 1930 some of the cleared land has begun naturally to revert to forest, and numerous sections have been planted with conifers, including the two native species, *Pinus strobus* and *Thuja occidentalies.*

12.19.1 (74.7). Shanks, R. E., and Goodwin, R. H. **Notes on the flora of Monroe County, New York.** *Proc. Rochester Acad. Sci.* 8, 1943 (299–331). [New York State Museum.] L.S.

An annotated list of the vascular flora of Monroe County, a relatively small area showing remarkable diversity of vegetation. Prior to white settlement the Beech/Sugar Maple association occupied more than half of the county, while Elm/Ash/Maple swamp forest and its variants occurred locally along stream margins and on other poorly drained sites in the Beech/Sugar Maple area. The largest continuous swamp forest occupied the flats of the Genesee River. Other forest associations included Hemlock/northern hardwood, Oak/Chestnut/Pine, upland Oak, and Oak/Hickory.

The tree species listed in this paper include *Taxus canadensis, Pinus rigida, P. strobus, Larix laricina, Tsuga canadensis, Thuja occidentalis, Salix petiolaris, S. serissima, Betula lenta, B. lutea, Castanea dentata, Quercus bicolor, Q. macrocarpa, Q. montana, Q. muhlenbergii, Q. velutina, Ulmus racemosa, Celtis occidentalis, Magnolia acuminata, Liriodendron tulipifera, Asimina triloba, Rhus vernix, Euonymus atropurpureus, Acer negundo, A. pennsylvanicum, Nyssa sylvatica,* and *Fraxinus nigra.*

12.19.1 (76.3) : 12.25–8. DORMON, C. **Forest trees of Louisiana.** Division of Forestry, Louisiana Department of Conservation. 1941. pp. 87.

This booklet, which has been prepared for general use, contains descriptions of those trees of Louisiana 'that have commercial value, that are very common, or that are particularly odd or beautiful'.

12.19.1–2 (77.4) : 09.1. KENOYER, L. A. **Forest associations of Ottawa County, Michigan, at the time of the original survey.** *Pap. Mich. Acad. Sci.* 28, 1942 (47–9). [Western Michigan College of Education, Kalamazoo, Michigan.] O.B.

A map shows the probable distribution of forest types in Ottawa County when it was surveyed during the period 1831–4. At that time the most common tree association was Beech/Maple with Hemlock, especially in that half of the county nearest Lake Michigan. The relative abundance of species is indicated by the following percentages, based on the frequency of species used as bearing trees by the surveyor:—Beech (33·7), Hemlock (13·5), Sugar Maple (12·5), Pine (8·6), Black and White Ash (7·3), Oaks (5·1), Soft Maples (5·0).

12.19.1 (77.6) : 23.24 : 12.25–8. **Trees of Minnesota: how to know them. A pocket manual.** Minnesota Department of Conservation, St. Paul, Minnesota. 1942. pp. 64.

This booklet gives brief descriptions of 50 of the more common trees of Minnesota under the headings:—form; bark; leaf; fruit; range; wood. A simple key is given for the identification of evergreen and deciduous trees by leaf form, and short sections are appended on the planting and care of trees, trees for schools, how to establish a community forest, food and cover plantings for wildlife, and how to prevent forest fires.

12.19.1 (86) : 31.0 : 31.2. JARAMILLO, J. M. D. Botanica general colombiana. **[General botany of Colombia.]** Manizales. 1943. pp. 400. [Span.] *Abstr.* in *Trop. Woods* 75, 1943 (28).

This text book of general botany, published by the Government for official use in the schools of Colombia, contains classifications of native commercial timbers according to their properties and uses (pp. 174–6), tables of mechanical properties of 100 woods (pp. 340–1), and the 'Diccionario taxonómico de la flora industrial de Colombia' (pp. 349–81).

12.19.2. *Forest Types*

12.19.2 (74.9) : 43.02. **Forest fuel types of New Jersey.** New Jersey Department of Conservation and Development, Trenton, New Jersey. 1942. pp. 4 + plates.

The eight major forest-fuel types are described and illustrated with the aid of photographs.

12.19.3. *Other Vegetation Types*

12.19.3 (47.1) : 34.21. KALELA, A. **Meadows and meadow-like plant communities on the Rybachi [Rybatski] Peninsula in Petsamo, Lapland.** *Acta for. fenn.* 48, 1939 (1–523). [G.] S.P.S.

The greater part of this paper deals with the vegetation of the grasslands that are used for hay-making by the Finnish fisher-farmers in the western part of the Rybachi (Rybatski) peninsula. Much of the land was originally covered with Birch and Willow, though a small portion of it is more or less natural grassland. The vegetation other than grassland (Birch woods, heaths, moors, tundra, etc.) is treated briefly.

12.2. *Special [Systematic] Botany*

12.2. CAMP, W. H., and GILLY, C. L. **The structure and origin of species, with a discussion of intraspecific variability and related nomenclatural problems.** *Brittonia* 4, 1943 (323–85).

The expanded phase of biological systematics (biosystematy) dealt with in this paper seeks (1) 'to delimit the natural biotic units', and (2) 'to apply to these units a system of nomenclature adequate to the task of conveying precise information regarding their defined limits, relationships, variability, and dynamic structure'.

It is now possible to attack the so-called 'problem of the species' more effectively as present investigators have two types of information which earlier systematists lacked: ever-increasing data on the genetic structure of populations, and means of analysing the mechanics of genetic variability. It is now recognized that species are not of one common origin, but may arise in various ways, so that there are various kinds of species, depending upon the type of genetic system operative within a group, and its present stage of evolution. Only spermatophytes are dealt with in the present study, but it is probable that the definitions laid down for these may be more widely applicable.

The concepts of species are based upon (1) the appearance of species-populations in the field, and (2) the genetic systems operative within these populations. It is necessary to accept the principles that species do not possess the same amount of internal genetic variability and that all individuals in a species may not exactly match the particular specimen which happens to be regarded as the nomenclatural type. A species is a kind of population rather than a particular kind of organism, and it is the genetic structure of the species which makes it a recognizable unit. To consider as species only those populations which are both morphologically and genetically alike and which operate within a single reproductive system either sexually or asexually would bring such confusion to our present system of nomenclature that it would cease to have any practical value. On the other hand, to ignore the various genetic units and include in a species all forms which can be shown to be capable of interbreeding and producing fertile offspring would be equally absurd.

A preliminary analysis is given of the types of internal variation to be expected in various kinds of species, and of some of the possible ways in which species have arisen. The types of species are named according to their chief characteristics and are divided into two broad groups: (*a*) species in which apomixis is not present (10 types), and (*b*) species in which apomixis is present (2 types). Each type is defined and discussed.

It is necessary in the classification of organisms to decide the kinds of things which should receive nomenclatural recognition. This problem is particularly marked in the case of hybrids and of disjunct populations, which receive special mention. In considering the subspecific category, investigators differ as to whether a species should be regarded as composed of its subspecific entities, or whether such entities should be considered merely as appendages of the species. As already stated, however, species have arisen in different ways, and it is possible for a species to be complex because of either accretional or concretional elements, or a combination of both. There are thus also different kinds of subspecific entities.

The subspecies itself is regarded principally as that

segment of a species which may be separated from other segments by definable differences in both morphology and distribution. So many meanings have been given by different authors to another subspecific unit, the variety, that it is proposed to restrict the use of the term to exploratory systematics in order to designate a subspecific unit which is recognized as atypical but has not yet been analysed against the background of the species of which it is a part. The term 'forma' is also capable of wide variation in meaning and is often used loosely to represent those elements of a species which appear to be minor variants. It is suggested that this term should be more suitably limited to variant individuals which occur intermixed with those of the species or species segment with which they are nomenclaturally related. If, however, such variant individuals constitute a population whose distribution is primarily distinct from that of the other segment or segments of the species, they could in general be considered as members of a subspecies. The decision, therefore, as to whether a recognizable variant should be regarded as a form or a subspecies would lie not so much in the degree of morphological divergence between it and the other segment or segments of the species as in their relative distribution, the form always being intermingled with its coordinate population segment, and the subspecies having a distinct area of distribution.

In a discussion of the subspecific categories from the point of view of bio-systematy the new subspecific category or 'phenogen' is introduced to designate those morphologically indistinguishable segments of a species (the phenon) which, although themselves sexually reproductive, are intersterile. It would also seem advisable to differentiate between apomictic and non-apomictic forms, the term 'forma apomicta' being used for those clonal populations which reproduce by any of the various types of apomixis, and the term 'forma genetica' for those types which are reproductive by means of sexual mechanisms. The category 'stropha' is suggested to designate individuals found in the wild state which are aberrant or unusual in the group to which they are biologically related, and which, generally speaking, give little or no evidence of having been able to reproduce, except possibly by vegetative means.

The paper is not regarded as a complete presentation of the science of biosystematy, but it is hoped by its publication to stimulate further discussion of the problems involved.

12.21. Fungi

12.21 (73). BAXTER, D. V. **Some resupinate polypores from the region of the Great Lakes. XIV.** *Pap. Mich. Acad. Sci.* 28, 1942 (215–33 + plates). [University of Michigan.] O.B.

Descriptions and notes on habitat and distribution are given for the following species:—*Polyporus pallescens, P. nidulans, P. radiatus, P. dichrous, P. resinascens, P. albolutescens, Poria mutans, P. mutans tenuis, P. vulgaris, P. subincarnata, P. ossea* sp. nov., *Trametes hispida*, and *T. odorata*.

12.21. AINSWORTH, G. C., and BISBY, G. R. **A dictionary of the fungi.** Imperial Mycological Institute, Kew, Surrey. 1943. pp. viii + 359. 20/- or U.S. $4.60 post free.

This book, which, apart from the appendix, is written in basic English, gives a list of all the generic names of fungi that have been in use to the end of 1939. For every genus a systematic position is given, together with the distribution and number of species. In addition, there are short accounts of the chief families, orders and classes of fungi and of the bacteria and lichens; explanations of words used in mycology; the common and scientific names of important fungi; and other details of interest to systematic and to applied mycologists and to plant pathologists.

12.21 : 12.14.5 : 12.26–8. INGOLD, C. T. **Aquatic hyphomycetes of decaying Alder leaves.** *Repr.* from *Trans. Brit. mycol. Soc.* 25 (4), 1942 (339–417 + plates). [University College, Leicester.] I.M.I.

Sixteen fungi (10 of which appear to be new species) were found growing and sporulating on decaying Alder leaves in the bed of a small stream which drains Cropston Reservoir near Leicester. All were aquatic Hyphomycetes, and the six known species were *Lemonniera aquatica, Clavariopsis aquatica, Tetracladium marchalianum, Tridentaria setigera, Varicosporium elodeae* and *Fusarium longissimum*. These fungi, together with the 10 new species, are described, emphasis being laid on features of diagnostic importance.

12.25. Gymnosperms

12.25 (410) : 76.3. HOWARD, A. L. **Cultivation of the Douglas Fir in Great Britain.** *Nature, Lond.* 151, 1943 (492–3).

The profitableness of growing Douglas Fir under British conditions is discussed.

12.25 (74) : 12.14.6. FASSETT, N. C. **The validity of *Juniperus virginiana* var. *crebra*.** *Amer. J. Bot.* 30, 1943 (469–77). [University of Wisconsin, Madison, Wis.] O.B.D.

By means of photographs of more than 700 individual trees of *Juniperus virginiana*, the author has assembled data on the crown height/width ratio of this species in 19 American states. The narrow-crowned variety, *J. virginiana* var. *crebra* is found chiefly in an area stretching from eastern Pennsylvania to southern Maine, and in a second area following a series of moraines from northern Indiana to southeastern Wisconsin. It also occurs sporadically in central New York, Tennessee, western Indiana and eastern Missouri. Examination of the leaves of the species shows that the degree of acuteness is of no taxonomic value in distinguishing var. *crebra*; and although the seeds of var. *crebra* are rather less conspicuously pitted than are those of the typical broad-crowned tree, this characteristic is not sufficiently marked to be of use in diagnosis.

12.26–8. Dicotyledons

12.26–8. MONACHINO, J. **Reduction of *Castelaria brittonii* Small.** *Trop. Woods* No. 75, 1943 (4–5). [Merck Research Laboratory, Rahway, New Jersey.]

Laboratory experiments with *Castelaria brittonii* Small gave no evidence of any biological-chemical relationship between this species and other members of *Castela* (= *Castelaria*, family Simarubaceae) previously tested. A careful examination of the type specimen revealed that it was identical with that of *Henoonia angustifolia* Urban [*Fedde Rep.* 18, 1922 (120)], which is therefore the proper binomial of this species. The genus *Henoonia* appears to be better suited taxonomically to the Sapotaceae than to the Solanaceae in which

it was placed by Grisebach, but its retention tentatively in Solanaceae is not disputed.

12.26–8 : 01.2. LITTLE, E. L. **Notes on the nomenclature of *Carya* Nutt.** *Amer. Midl. Nat.* 29, 1943 (493–508). [U.S. Forest Service, Washington, D.C.] L.S.

Notes are given on the nomenclature of *Carya* Nutt. (family Juglandaceae; common name Hickory), and the history of the two rival genera, *Carya* Nuttall (1818), *nomen conservandum*, and *Hicoria* Rafinesque (1817), *nomen rejiciendum*, is reviewed. Three new combinations and one new name in *Carya* are published. The new combinations are *Carya texana* Buckl. var. *arkansana* (Sarg.) Little, *Carya texana* Buckl. var. *villosa* (Sarg.) Little, and × *Carya endoviciana* (Ashe) Little, a hybrid between *Carya aquatica* (Michx. f.) Nutt. and *Carya texana* var. *arkansana* (Sarg.) Little. A new name × *Carya lecontei* Little, is made for the Bitter Pecan, a hybrid between *Carya aquatica* (Michx. f.) and *Carya illinoensis* (Wangenh.) K. Koch.

12.26–8 : 12.14 : 12.11.3. SENN, H. A. **The relation of anatomy and cytology to the classification of the Leguminosae.** *Chron. bot.* 7, 1943 (306–8). [Dept. of Agriculture, Ottawa.] O.B.D.

The family Leguminosae exhibits a wide range of morphological variability and includes among its members trees, shrubs and herbs from areas which are often climatically very diverse. The evolutionary trends found in the structure of the secondary xylem are briefly reviewed in this paper, and the present extent of our knowledge of the cytology of the family is indicated. Judged on the basis of the fundamental characters of vessel segment length and configuration, the Leguminosae is stated to be a relatively natural, highly specialized group, with no sharp lines separating the three subfamilies. On the basis of other characters, however, there appears to be, in some instances, increasing specialization from the Mimosoideae through the Caesalpinioideae to the Papilionatae.

At the present time it is not possible to correlate successfully the available data on the anatomy and cytology of the Leguminosae owing to the fact that most of the anatomical data has been obtained from woody species which are largely tropical, whereas chromosome numbers have been determined mainly for herbaceous, temperate species of the subfamily Papilionatae.

12.26–8 (410) : 56 : 33.15. BALFOUR, F. R. S. ***Populus trichocarpa*. Torrey and Gray.** *Scot. For. J.* 57, 1943 (50–3).

Trees planted at Dawyck, Scotland, since 1912, have shown good growth. Peeling tests on logs from a 34-year-old tree gave satisfactory results.

12.26–8 (410) : 21.0 : 31.2. HOWARD, A. L. **The Plane tree.** *Nature, Lond.* 152, 1943 (421–2).

Reference is made to the occurrence of the Plane tree in the Ancient World, as recorded by various early writers, and examples are given of the fine growth of species of *Platanus* under difficult conditions in Britain at the present time. In America, France and Germany, the value of the wood has been fully realized, but in England it is used only as fuel.

12.26–8 (42.1–8) : 21.0. **Hardiness of Eucalypti.** *Gdnrs.' Chron.* 113, 1943 (236). O.B.D.

The writer states that, to the best of his knowledge, three 50-year-old specimens of *Eucalyptus whittingehamensis* situated in an exposed position in his garden in Kent have never been injured by frost and have suffered only minor damage from wind.

12.26–8 (42.1–8) : 21.0 : 42.21. HILLIER, E. L. **Hardy Eucalypti.** *Gdnrs.' Chron.* 113, 1943 (217). O.B.D.

Eucalyptus gunnii Hook and its variety, *E. gunnii* var. *montana*, growing in Hampshire on sandy loam, are reported to have survived the low temperatures of 1940–41–42, although var. *montana* was topped by frost. Other species which withstood the severe winters, but which were cut back about half way, were *E. urnigera*, *E. aquatica* var. *ovata* [sic], and *E. pulverulenta*. *E. coccifera* and *E. verrucosa* [*vernicosa*] were killed outright.

12.26–8 (42.1–8) : 21.0 : 56 : 34.27. HOWARD, A. L. **Walnut trees.** *Nature, Lond.* 151, 1943 (705).

Given a little care, the European Walnut (*Juglans regia*) can be grown successfully in England for the production of both fruit and timber. Saplings of this species have been known to reach a height of 5–8 ft. or more and a girth of 4½–5 in. at 2 ft. from the ground within 4 years when grown under suitable conditions. Both the nuts and timber of *Juglans regia* compare favourably with those of the Virginian Black Walnut (*Juglans nigra*) which does not thrive in Great Britain.

12.26–8 (47.1) : 12.19. ENKOLA, K. Der Sanddorn *Hippophäe rhamnoides* L.) im Schärenbezirk von Rauma. **[The Sallow Thorn (*Hippophäe rhamnoides* L.) in the archipelago of Rauma.]** *Silva fenn.* 53, 1940 (2–26). [G.] S.P.S.

Sallow Thorn (*Hippophäe rhamnoides*) is found on gravel soil near the sea on the shores of the Rauma archipelago in the southeast part of the Gulf of Bothnia. It probably migrated there as a member of the subalpine Birch vegetation after the last glacial period.

12.26–8 (51). VASSILIEV, V. N. **Systematics and geography of the far eastern Birches.** *J. Bot. U.R.S.S.* 27, 1942 (3–19). Plant Breeding Abstr. 13 (1389).

12.26–8 (52). VASSILIEV, V. N. **Notes on the systematics and origin of certain Japanese Birches.** *J. Bot. U.R.S.S.* 27, 1942 (77–80). Plant Breeding Abstr. 13 (1389).

The systematics and phylogeny of the section *Ermani* (Nakar) V. Vassil. of the genus *Betula* are discussed. The most primitive species are found in eastern Asia which is regarded as the centre of origin of the section.

In the second article two new species are described.

12.26–8 (51) : 33.12. HUI-LIN LI. **The Araliaceae of China.** *Sargentia* 2, 1942 (1–134). *Abstr.* in *Trop. Woods* 75, 1943 (30).

A systematic study of the Chinese Araliaceae in which an attempt is made to account for every published binomial as recorded from China in botanical literature since 1753. A total of 17 genera, 121 species, 32 varieties, and 3 forms are recognized.

The family consists of about 60 genera and more than 800 species, mostly woody plants, occurring in the tropical and, less frequently, in the temperate regions of both hemispheres. *Kalopanax pictus* (Thunb.) Nikai is an important timber tree, and a few species such as *Schefflera octophylla* Harms, produce lumber for furniture manufacture and other purposes.

12.26–8 (51 : 59.6–9). MERRILL, E. D., and LUETTA CHEN. **The Chinese and Indo-Chinese species of *Ormosia*.** *Sargentia* 3, 1943 (78–120). *Extr.* in *Trop. Woods* 75, 1943 (31).

'The objective in this attempt to revise the eastern Asiastic species of *Ormosia* is to enumerate all of the known Chinese and Formosan species, as well as those of Indo-China, to give the more important literature references, to adjust the synonymy, to cite all specimens available to us for study purposes, and to indicate the known range for each species. For the convenience of those who may have occasion to study the genus later an artificial key to the 34 recognized species has been prepared. The net result has been to increase the known Chinese species of *Ormosia* from 10 to 27, the additions all being in the form of previously undescribed species'.

12.26–8 (66.9) : 12.14.7. NIGERIA. **Annual report on Forest Administration for the year 1942.** Forest Department, Ibadan. 1943. pp. 19 + forms.

In the Cameroons *Eucalyptus maideni* bore fruit and fertile seed for the first time since it was introduced in 1930 (p. 5).

12.26–8 (728). LUNDELL, C. L. **Studies of tropical American plants—I.** *Contr. Univ. Mich. Herb.* No. 4, 1940. pp. 32.

The following new tree species are described from the Maya area (particularly from southern British Honduras and the mountains of Chiapas):—*Litsea matudai* Lundell, *Photinia matudai* Lundell, *Acacia usumacintensis* Lundell, *Dalbergia paucifoliolata* Lundell, *Bernardia mollis* Lundell, *B. oblanceolata* Lundell, *B. yucatanensis* Lundell, *Schaefferia elliptica* Lundell, *Clusia massoniana* Lundell, *Ardisia ovandensis* Lundell, *Bumelia tabascensis* Lundell, *Diospyros campechiana* Lundell, *Psychotria lundelii* Standl., *Randia lundelliana* Standl. and *Sickingia mollis* Lundell.

12.26–8 (728.3). ESCOBER, L. L. Apuntes sobre la *Myrtica cerifera* L. de Honduras. [**Notes on the species *Myrtica cerifera* of Honduras.**] *Carib. For.* 4, 1943 (163). [Span.]

12.26–8 (728.6). STANDLEY, P. C. **A Costa Rican species of *Vantanea*, of the family Humiriaceae, a group new to Central America.** *Trop. Woods* No. 75, 1943 (5–6).

A botanical description of *Vantanea barbourii* Standl., sp. nov., a Costa Rican tree belonging to the essentially South American family, Humiriaceae. The new species most closely resembles *V. obovata* (Nees & Mart.) Benth. of Brazil, from which it differs in certain apparently constant minor characters.

12.26–8 (728.6) : 12.19 : 31.2. BARBOUR, W. R. **Note on *Vantanea barbourii* Standley.** *Trop. Woods* No. 75, 1943 (7–8).

Vantanea barbourii Standl., known locally as Ira Chiricana, is found at elevations of 700–800 m. on rolling hills near San Isidro, Costa Rica. It occurs in patches, associated with *Laplacea semiserrata*, *Hieronyma oblonga*, *Goethalsia meiantha* (?), *Nectandra concinna*, *Persea austin-smithii*, *Ormosia toledoana* (?), *Cordia alliodora*, *Calophyllum brasiliense*, *Vochysia ferruginea*, *Jacaranda* sp., and various trees of the Lauraceae and Leguminosae. Specimens 36 in. or more in diameter with 40 ft. or more of clear length are not uncommon. The wood is reddish-brown, heavy, fairly hard, and is reputed to be strong and durable. It is being used for bridge timbers on the Inter-American Highway which traverses its range.

12.26–8 (729.1) : 12.19 : 21 : 23.24. FORS, A. J. **Encina, *Quercus virginiana* Mill.** *Carib. For.* 4, 1943 (158–63). [Span.e.]

Notes on the distribution of the species in Cuba and on its site requirements, silviculture, and utilization.

12.26–8 (729.5) : 56 : 21 : 23.2 : 22.22. WADSWORTH, F. H. **Pomarrosa, *Jambosa jambos* (L.) Millsp. and its place in Puerto Rico.** *Carib. For.* 4, 1943 (183–94). [E.e.span.] [Tropical For. Exp. Sta.]

Under the prevailing conditions the species can be grown profitably in coppice for the production of fuelwood and posts. It does well even on very poor soils.

12.26–8 (931) : 21.1–2. INGRAM, C. **Notes on the evergreen Beeches.** *Gdnrs.' Chron.* 113, 1943 (166–7). O.B.D.

Notes are included on the distribution of the genus *Nothofagus*, particularly in New Zealand, and on the climatic requirements of some species.

12.26–8 (95). HARMS, H. **Meliaceae novae.** *Bot. Jb.* 72 (2), 1942 (158–205). Biol. Abstr. 17 (18978).

Species new to New Guinea belonging to the genera *Xylocarpus*, *Aglaia*, *Aphanomyxis*, *Chisocheton*, *Dysoxylum* and *Sandoricum* are included.

12.29. Monocotyledons

12.29 (67.6) : 56. WIMBUSH, S. H. **Some observations on the growth of Kenya Bamboos in the Kinali plots from 1931–1938.** *Res. Bull. For. Dep. Kenya* No. 16, 1939. pp. 5.

13.1. *General Zoology*

13.11 : 13.2 : 31.43. KALTWASSER, J. Der Nahrungswert des Holzes für die Larven des Hausbockkäfers (*Hylotrupes bajulus*). [**The nutritional value of wood for the larvae of *H. bajulus*.**] *Mitt. biol. Reichsanst.* No. 65, 1941 (78–9). [G.] *Abstr.* in *Z. PflKrankh.* 52, 1942 (556). R.A.E. A31 (373).

In further experiments in Germany on factors affecting the growth of *Hylotrupes bajulus* L. [cf. *For. Abstr.* 5 (39)], the duration of total development was reduced to 14 months by impregnating the timber with protein substances. Suspensions of diastase caused especially marked acceleration in larval growth, but impregnation with soluble carbohydrates did not influence the rate of development. The larvae developed also in deciduous wood and in the heartwood of Pine if substances such as resin, that are harmful to them, were removed.

13.14 : 13.2. FORSSLUND, K.-H. Till kännedomen om myrbaggens (*Clerus formicarius* L.) biologi. [**On the knowledge of the biology of the bark beetle predator, *Clerus formicarius* L.**] *Svenska SkogsvFören. Tidskr.* 39, 1941 (95–8). [Sw.]

In spite of the common occurrence of the bark-beetle predator (*C. formicarius* L.), its pupa is rarely observed. Th eauthor has found that the full-grown larvae move from the tunnels of the bark beetle down to the base of the tree where they bore into the loose outer bark. Here they make oblong pupal chambers which are lined with a fine whitish membrane.

13.15 : 13.2. LINSLEY, E. G. **Attraction of *Melanophila* beetles by fire and smoke.** *J. econ. Ent.* 36, 1943 (341–2). [University of California.]

Various cases are cited of the behaviour of buprestid beetles of the genus *Melanophila* in response to the stimuli of fire and smoke. From the evidence collected, the author concludes that *Melanophila* beetles are

attracted over long distances by smoke from a variety of burning materials. Light probably plays no important part in this attraction, but heat stimulates the beetles so that they fly about rapidly in the vicinity of the fire and run over hot surfaces. In nature the attraction of smoke leads them to forest-fire areas where they normally oviposit in scorched coniferous wood.

13.15 : 13.2 (74.1) : 12.26–8 : 34.3. KITTAMS, W. H. **October food of ruffed grouse in Maine.** *J. Wildlife Mgmt.* 7, 1943 (231–3). [University of Maine, Orono, Maine.] B.A.P.

Examination of the food contents of 34 crops and gizzards of the ruffed grouse (*Bonasa umbellus*) showed that in Maine its October diet includes leaves and buds of Aspen (12·5 per cent.), buds of Yellow Birch, and, to a small extent, the samaras of *Acer pennsylvanicum* (4·7 per cent.). The absence of acorns as part of the diet is explained by the scarcity of Oaks in the region.

13.15 : 13.2 (74.8) : 12.26–8 : 34.3. BRAMBLE, W. C., and GODDARD, M. K. **Seasonal browsing of woody plants by white-tailed deer in the Bear Oak forest type.** *J. For.* 41, 1943 (471–5). [Pennsylvania State College.]

Results are given of a study to determine the seasonal preferences of white-tailed deer in browsing on various woody plants in the Bear Oak (*Quercus ilicifolia*) type in the 'Barrens' of central Pennsylvania.

13.15 : 13.2 (78.3 : 78.7) : 12.25–8 : 34.27. HILL, R. R., and HARRIS, D. **Food preferences of Black Hills deer.** *J. Wildlife Mgmt.* 7, 1943 (233–5). B.A.P.

Analyses of the stomach contents of 79 white-tail deer (*Odocoileus virginianus macrourus*) and 22 mule deer (*O. hesmionus*), killed in the northern Black Hills of South Dakota and Wyoming during 1941, showed that the food plants utilized by the deer during the most critical winter period (January to May) included Ponderosa Pine (*Pinus ponderosa*), and to a lesser extent Bur Oak (*Quercus macrocarpa*), Willow (*Salix* spp.), Aspen (*Populus tremuloides*), Paper Birch (*Betula papyrifera*), White Spruce (*Picea glauca albertiana*), and Ironwood (*Ostrya virginiana*). Aspen was utilized mainly in the spring soon after the leaves appeared. The use of dry needles of Pine and Spruce was probably incidental to other feeding.

13.19 : 13.2 (41.5). QUIRKE, D. A. ***Eccoptogaster scolytus* F. (Col., Ipidae) in Ireland.** *Ent. mon. Mag.* 79, 1943 (198).

A report of the first record of *Eccoptogaster scolytus* F. (*Scolytus destructor* Ol.) for Ireland (Co. Kerry).

13.2. *Special [Systematic] Zoology*

13.2 : 45.3 : 12.26–8. EIDMANN, H. Zur Kenntnis des Buchenspringrüsslers *Orchestes* (= *Rhynchaenus*) *fagi* L. **[A contribution to the knowledge of *R. fagi*.]** *Z. PflKrankh.* 53, 1943 (42–61). [G.] R.A.E. A31 (377).

An account is given of observations near Hanover in 1942 on the bionomics of *Rhynchaenus* (*Orchestes*) *fagi*, L., on Beech. A list compiled by Fulmek of the parasites recorded from this weevil is included.

13.2 (42.1–8) : 12.26–8. HARRISON, J. W. H. **Variation of *Apatele psi* L. (Lep., Agrotidae) in Durham.** *Ent. mon. Mag.* 79, 1943 (258).

Examination of a considerable number of specimens of *Apatele psi* in Durham during the present season (1943) revealed that those found on Willows along the Wear banks at Chester-le-Street were all var. *suffusa* Tutt, while those on Poplars, Oaks, etc. at Birtley, only 4 miles away, were quite typical.

13.2 (7) : 45.3 : 12.25. BLACKMAN, M. W. **Revision of the genus *Phloeosinus* Chapuis in North America (Coleoptera, Scolytidae).** *Proc. U.S. nat. Mus.* 92, 1942 (397–474 + plate). O.R.S.

This paper deals with the 45 known North American species of the widely distributed genus of bark beetles, *Phloeosinus*, including 16 species described for the first time. All but 3 of the North American species breed in the inner bark of cupressine and taxodiine trees of the genera *Sequoia*, *Taxodium*, *Libocedrus*, *Thuja*, *Cupressus*, *Chamaecyparis*, and *Juniperus*. Of the 3 nonconforming species, one breeds in *Pinus* and 2 in *Picea*. These species differ from the others not only in host selection but in certain morphological characters. Of the 40 species known to occur in the United States and Canada, only 5 are found in the eastern half of the continent. The twig feeding of the adult is responsible for most damage, but breeding activities may also cause considerable injury under certain conditions.

13.2 (7). TUTHILL, L. D. **The psyllids of America north of Mexico.** *Iowa St. Coll. J. Sci.* 17, 1943 (443–667).

The psyllids (jumping plant lice) are represented in America, north of Mexico, principally by two subfamilies of the Psyllidae —Psyllinae and Triozinae. An attempt is made in this paper to give a systematic presentation of all the forms of these two subfamilies in the above region, incorporating all known data other than that of purely economic importance. Keys to the subfamilies, genera and species are included, and the type species of each insect is described.

2. SILVICULTURE

21. SILVICULTURAL CHARACTERS OF TREE SPECIES

21.0. *Adaptability to the General Environment. Acclimatization*

21.0 : 12.25 (489) : 45.3 : 13.2. HOLM, F. Douglasgran, Proveniens og Vaekst. **[Douglas Fir, provenance and development.]** Det Forstlige Forsøgsvaesen i Danmark, *Report* 15 (4), 1941. pp. 80. [Dan.] S.P.S.

An account is given of the Danish research work with Douglas Fir (*Pseudotsuga taxifolia*), formerly reported on by Opperman (*Report* 10, 1929), and of the experimental plots of 1929 and later.

Different climatic races of 'green' Douglas Fir have developed very satisfactorily in Denmark. In many cases it can be shown that a close correspondence in climate between seed source and planting area is not necessary and there seem to be good possibilities of adapting this variety to the Danish climate.

Dangers from fungi and insects do not appear to be great enough to prevent the cultivation of Douglas Fir in Denmark, although information on *Adelopus* is not yet satisfactory.

21.0 : 12.25 (489) : 21.61 : 12.11.23 : 23.21. BORNEBUSCH, C. H. Fremmede Naaletraeer paa Søllestedgaard. **[Exotic coniferous trees on Søllestedgaard estate.]** Det Forstlige Forsøgsvaesen i Danmark, *Report* 15 (5), 1941. pp. 32. [Dan.] S.P.S.

The author describes an experimental area of 461 plots planted during the period 1894–1912 with more

than 50 different conifers. This was previously described by Storm in 1914 (*Report* 4, 1915).

The 'green' variety of Douglas Fir has developed very well, reaching a height of 24·5 m. in 51 years. *Abies grandis* has shown the best development with a height of 22 m. in 30 years, and is quite healthy, windfirm and a well-formed tree. The following species have also developed satisfactorily:—*Abies alba, A. nordmanniana, Picea abies*, which is better than *P. sitchensis, Pinus sylvestris, P. austriaca, Cryptomeria japonica* and *Thuja plicata*. Trees of Japanese Larch (*Larix leptolepis*) are particularly well formed.

21.3. *Soil Requirements*

21.3 : 11.41.7 (43.1–5) : 11.42. SÜCHTING, H. **The characteristics and valuation of forest soils. II. Magnesia-rich soils formed by weathering of Silurian and Devonian rocks and culm of the Harz Mountains.** *Bodenk. PflErnähr.* 27. 1942 (289–310). Chem. Abstr. 37 (4174). P.R.

From a study of 70 soils it is concluded that conditions for good growth of forest trees are as follows:— no exchangeable acidity, pH more than 4·5 (optimum for many species is 5 to 5·5), at least one unit difference between pH in water and in KCl solution, small amount of soluble Al (in 1 per cent. citric acid, highest about 0·3 per cent. depending on the degree of acidity), and the nutrient status of the soil must be good. There should be little or no humus in the A_0 horizon. The A_0 humus present should be rich in minerals and nutrients with the exception of N. A detailed study was made of 21 forest soils of the upper and lower Harz Mountains, including mechanical analyses, structure, soluble Al, pH (H_2O), pH (KCl), exchangeable acidity, CaO, MgO, K_2O and P_2O_5 soluble in 10 per cent. HCl, and K_2O and CaO soluble in 1 per cent. NH_4Cl. Most of these determinations were also made on the humus layer. The humus is richer in nutrients when the soil on which it is formed is less acid. The 21 soils are discussed in detail.

21.3 : 12.26–8 (489) : 12.11.23 : 23.21. BORNEBUSCH, C. H. Fremmede Løvtraeer paa Esrom Skovdistrikt. **[Exotic deciduous trees in Esrom Forest District.]** Det Forstlige Forsøgsyaesen i Danmark, *Report* 15 (5), 1941. pp. 12. [Dan.] S.P.S.

Results from an experimental planting of species of *Quercus* and *Betula*, made in 1909–13, on a poor, sandy and acid soil in the Grip Forest, show that *Q. borealis* has done better than *Q. robur, Q. coccinea* or *Q. palustris*. *Betula japonica* and *B. maximowizii* developed as well as *B. pubescens*, and on better soil they have shown more rapid height growth.

21.32 (75.9) : 11.42.3 : 12.25 : 12.26–8. DE VALL, W. B. **The correlation of soil pH with distribution of woody plants in the Gainesville area.** *Proc. Fla. Acad. Sci.* 6 (1), 1943 (9–24). [University of Florida.] L.S.

A study was made to obtain specific data on the relationship between soil acidity and the species and distribution of woody plants present in the Gainesville district, Florida. The seven areas selected for study represented the following major forest types:– (1) Pine flatwoods, (2) mixed hardwood hammock, and (3) Scrub Oak ridge. All trees within a radius of 20 ft. and all associated shrubs within a radius of 10 ft. of a soil sample were tallied.

Of the 68 species included in the study, 28 occurred on definitely alkaline soils, 28 on neutral soils, 41 on slightly acid soils with a pH of 6·0–7·0, 50 on moderately acid soils (pH of 5·0–6·0), 12 on strongly acid soils (pH of 4·0–5·0), and one (*Pinus palustris*) on an extremely acid soil with a pH of 3·8.

The species are grouped in five fidelity classes according to sociological tendencies to mix with other plants on a large scale or to be exclusive.

21.6. *Behaviour in the Stand*

21.6 : 12.25. ÅKERHIELM, L. Fortsatta undersökningar over tallens växtsätt. **[Further studies on how Pine grows.]** *Svenska SkogsvFören. Tidskr.* 39, 1941 (279–304). [Sw.]

Various examples, based on field experience, are given to indicate conditions favourable to natural pruning, the relation between branch and trunk development, the reaction of a tree to changes in environment, etc. It is suggested that hormones play an important part in these reactions. The forking of leading shoots, apparently not due to injury, is described and illustrated.

21.61 : 12.25 : 12.11.22. NEW ZEALAND. **Annual report of the Director of Forestry for the year ended 31st March, 1943.** Govt. Printer, Wellington. 1943. pp. 24.

Thirteen-year-old trees of *Pinus radiata* propagated from cuttings showed no differences in dimensions or form from those propagated in the usual way (p. 5).

21.61 : 12.25 : 12.11.3 : 56. Bör kamgranen gynnas vid beståndsvårdshuggningarna? **[Should the 'comb' type of Spruce be favoured in stand-improvement cuttings?]** *Skogsägaren* 17, 1941 (145–6). [Sw.]

Norway Spruce is segregated into 5 branch types— comb, irregular comb, band, plane and brush. The pure comb type appears to be superior to the other types both in freedom from defect and in growth capacity, and chemical analysis has shown that it gives a relatively high yield of cellulose.

In 1939 investigations were begun in 50- to 70-year-old Spruce stands selected to include as many as possible of the pure comb type; the percentage of these varied in different stands from 19·4 to 64·8. It was noted that the proportion of comb Spruce had increased in the older stands that had been well thinned several times. In one stand in which there was a high proportion of comb Spruce, these trees averaged 29·4 cm. in diameter and 26·6 m. in height compared with 23·9 cm. and 23·5 m., respectively, for Spruce of other branch types.

21.64 : 12.25 : 23.23.19 : 21.1–2. MEAGHER, G. S. **Reaction of Pinon and Juniper seedlings to artificial shade and supplemental watering.** *J. For.* 41, 1943 (480–2). [Pacific Northwest Forest & Range Exp. Sta., Portland, Ore.]

A study was made in north-central Arizona to compare the germination of seed and survival of seedlings of Piñon Pine (*Pinus edulis*), One-seed Juniper (*Juniperus monosperma*) and Utah Juniper (*J. utahensis*) planted under natural conditions and with shade and moisture artificially provided, individually or in combination. While shading and watering treatments hastened germination they did not appreciably influence the final germination percentage. Survival was relatively high where seed spots were both watered and shaded, intermediate where either shading or water was used separately, and nil where seed spots were untreated.

21.64 : 22.88 : 12.25 : 22.13–4 : 56.02. WADSWORTH, F. H., and PEARSON, G. A. **Growth and mortality in a**

virgin stand of Ponderosa Pine compared with a cut-over stand. *Res. Rep. Sthwest. For. & Range Exp. Sta.* No. 5, 1943. pp. 15.

Diameter measurements and records of mortality were obtained at 5-year intervals over a period of 15 years for virgin and cut-over stands of Ponderosa Pine in the southern states; additional data on virgin stands were available for a 25-year period. It is shown that cutting under a group selection method, by which 70 per cent. of the volume was removed, has resulted in lower mortality and increased diameter growth in the residual stand as compared with the virgin stand; while diameter growth in the virgin stand fell off rapidly above the 10-in. class, in the cut-over stand growth was maintained in trees up to 24 in. in diameter and even larger. Causes of mortality in order of importance in virgin and cut-over stands are :—(1) Virgin stand—lightning, bark beetles, wind, mistletoe; (2) Cut-over stand—lightning, wind, bark beetles, mistletoe.

22. SILVICULTURAL SYSTEMS. FORMS OF STAND

22.14.1 : 33.02 : 12.26–8 : 32.25. LYMAN, R. R., and OSTROM, C. E. **Keep them growing: save time and timber while harvesting chemical wood.** *For. Leaves* 33 (2 & 3), 1943 (3, 10–3, 16).

In the past, clear-cutting in progressive strips has been the method of exploitation most favoured by chemical-wood cutters, and this method tends to persist at the present time. Experiments have proved, however, that selective cutting of second-growth stands can be both cheaper and more efficient than clear-cutting. The Armstrong Forest Company of Johnsonburg, Pennsylvania, have for several years been successful with selective cutting of cordwood for paper pulp from Beech/Birch/Maple/Cherry stands in the Allegheny Plateau chemical-wood area, and a study made by the Gray Chemical Company in co-operation with the U.S. Forest Service showed that where all trees of less than 7-in. diameter were left, the time required for cutting and piling was 10 per cent. less than in clear-cutting.

The cutting of undersized trees causes wastage of labour and time, whereas selective cutting of northern hardwoods, particularly before the age of 40 years, will improve the stand and provide a more continuous income for the owner, who is also enabled by this method to retain some of his growing stock for larger and more valuable products. It is recommended that the pole-skidding method of harvesting should be employed wherever feasible. Although mechanization may result in saving, large-scale mechanization of cordwood cuttings is undesirable as the trend should be rather towards decentralization and localized sustained yield, with permanent residents dependent upon fairly small units of land.

22.88.2 (75.4–6) : 65.7 : 23.1 : 12.26–8. FROTHINGHAM, E. H. **Some observations on cutover forests in the southern Appalachians.** *J. For.* 41, 1943 (496–504). [Appalachian Forest Exp. Sta., Asheville, N.C.]

Comparisons are made of stand and regeneration conditions at different periods following a number of timber sales on southern Appalachian national forests. In general, the quality of the cut-over areas was found to be reasonably good, although there was some indication of decrease in quality with the length of period since cutting. Data from areas cut-over 6 years before the examination or earlier, support the use of light partial cutting in stands containing a relatively large proportion of good trees or good poles, and of heavy cutting where good trees and poles are scarce but good saplings are abundant.

A method is suggested for classifying the potential qualities of the stands on cut-over areas, based upon the quantities per acre of good stems (trees, poles and saplings) only.

23. FORMATION OF STANDS

23.1. *Natural Regeneration*

23.1 : 12.25 (485). ARNBORG, T. Lågaföryngringen i en sydlappändsk granurskog. **[The reproduction on fallen logs in a virgin Spruce forest in southern Lapland.]** *Svenska SkogsvFören. Tidskr.* 40, 1942 (47–78). [Sw.]

As is well known, in certain northern woods Spruce reproduction is found mainly on decayed fallen logs. This phenomenon is described and illustrated and the reasons for it are discussed. No conclusion is reached.

23.1 : 12.25 (931). NEW ZEALAND. **Annual report of the Director of Forestry for the year ended 31st March, 1943.** Govt. Printer, Wellington. 1943. pp. 24.

Natural regeneration of *Pinus radiata* is reported to be very promising in areas clear-felled during the period 1940–42. Some mortality has been caused by the bark beetle (*Hylastes ater*) and the honey fungus (*Armillaria mellea*); the beetle damage is insignificant and appears to be abating. Regeneration had not become established on areas experimentally burned to a heavy, moderate and light degree respectively. Season of felling did not appear to have any significant effect on regeneration (pp. 4, 5, 7).

23.2. *Artificial Regeneration*

23.21. Choice of Species

23.21 (66.9) : 23.24.3. NIGERIA. **Annual report on Forest Administration for the year 1942.** Forest Department, Ibadan. 1943. pp. 19 + forms.

Experience indicates that one of the best plantation mixtures for Nigeria would be a matrix of *Lovoa klaineana* at 12 × 12 ft., interplanted with *Khaya* spp. and *Sarcocephalus diderrichii* at about 24-ft. intervals (p. 11).

23.21 : 12.26–8 (485) : 31.0. Asken ett trädslag som bör gynnas. Södra Sverige har gott om lämpliga lokaler för ask, och den är tacksam att ägna sig åt. **[The Ash, a tree which should be encouraged. There are in south Sweden many localities suitable for Ash, and its cultivation is remunerative.]** *Skogen* 29, 1942 (319–20). [Sw.]

In the past large quantities of Hickory have been imported into Sweden for use in the manufacture of skis, tool handles, etc. An effort is now being made to replace this species with home-grown Ash. Immediately before the outbreak of war the possibilities of growing Hickory were being tested, but in the majority of cases there are better prospects of success with Ash, which makes rapid growth and is not difficult to manage.

23.23. Sowings

23.23.1. *Seed Procurement, Treatment, and Testing*

23.23.11 : 12.25 (47.1) : 12.14.7 : 44.3 : 45.3. KANGAS, E. **Damage to cones and seed yield of Spruce in 1937.** *Commun. Inst. for. Fenn.* 29 (2), 1940 (1–38). [Finn.g.] S.P.S.

Damage to crops of Spruce cones in Finland is frequently severe. The 1937 crop was attacked by practically every insect and fungus known to be injurious to Spruce cones. On the whole the attack was as severe, if not more so, in mixed stands as in pure stands; damage was greatest in old stands. The yield of viable seed was greatly reduced by this attack.

23.23.12 : 07.7. LINDQUIST, B. En stege för kottplockning i stående träd. [**A ladder for gathering cones from standing trees.**] *Skogen* 29, 1942 (89). [Sw.]

A one-legged ladder, 18 m. long and weighing about 33 kg., was recently tested by the Forest Tree Breeding Association. It proved to be the safest and most effective of a number of new designs tested. For purposes of transport the ladder can be separated into 7 sections of 2·5–3·2 m. in length. R. P. J.

23.23.15. TIREN, L. Förvaring av skogsfrö. Erfarenhetor från Hällnäs och Bollnäs. [**Storing of seed of forest trees. Experiences at Hällnäs and Bollnäs.**] *Skogen* 29, 1942 (350–2). [Sw.]

Seed in storage must be kept uniformly dry; for this purpose it should be stored in air-tight vessels, preferably glass jars or bottles, which are filled with seed to 90 or at most 95 per cent. of their volume. Glass vessels used in storing seed are corked and sealed with resin or paraffin wax; if sheet-metal vessels are used, these are carefully soldered. The seed must also be kept cool.

At the seed-extracting plant at Bollnäs the seed is stored in soldered zinc-plate containers, which hold about 25 kg. of seed. The containers are placed in a seed cellar where the temperature is maintained at 5–6° C. The seed is tested for its germination capacity at the time of storage and on each occasion when a container is opened in order to use part of its contents.

At Hällnäs the seed is stored in glass bottles that are corked and sealed with paraffin wax. The temperature of the seed cellar is low; on 21st November, 1942, it was 2° C.

Available data show that Pine seed can be stored for at least 13 to 15 years without perceptible reduction in germination percentage.

Experiments conducted by the Swedish Forestry Research Institute confirm the results cited above as to the good effect of a cool storage place and air-tight packing. They show further that if these conditions are not fulfilled the germination capacity of the seed is often markedly reduced. R. P. J.

23.23.19 : 12.11.3. JENSEN, H. Nya vägar för produktion av högklassigt skogstradsfrö. [**New ways of producing high-grade forest tree seed.**] *Skogen* 29, 1942 (73–7). [Sw.]

In order to obtain seed from selected strains in a relatively short time, it is possible by artificial means to develop 'dwarf trees' that will produce a heavy crop of fruit at an early age; an added advantage is that the seed can be harvested from the ground. In horticultural practice, strangulation and bark-ringing have long been used for this purpose, and experiments have shown that by means of strangulation, good results can also be obtained with a number of Swedish forest trees, e.g. White Spruce, Oak, Alder, Birch and Maple.

23.23.19 : 12.26–8 : 42.22 : 11.14.3. PRASAD, J. **Seeding of *Anogeissus latifolia*.** *Indian For.* 69, 1943 (193–6 + plates). [Forest Research Institute, Dehra Dun.]

Annual seed production of *Anogeissus latifolia* is usually abundant but the seed is of low germination capacity. Observations by Pearson [*Indian For.* 33, 1907 (231–40)] indicated that reproduction was most abundant following a year of deficient rainfall. In order to determine the effect of drought on seed viability an experiment was begun in 1928 and continued until 1942, four typical trees in the Saharanpur Forest Division being selected for observation. During the period of the experiment rainfall was significantly low in the years 1929, 1930, and 1936. In 1929 and 1930 the decrease in rainfall was accompanied by a marked increase in the germinative capacity of the seeds of *A. latifolia*. As the 1936 results were of an exceptional character they could not be used as evidence.

23.23.19 : 12.26–8 (54) : 21.12. GRIFFITH, A. L. **Seed data of *Crypt[o]stegia grandiflora*.** *Indian For.* 69, 1943 (268–9). [Forest Research Institute, Dehra Dun.]

Seeds of *Cryptostegia grandiflora* may be collected between February and May. Tests have shown the average germination to be 83 per cent., but owing to the damage by crickets, the number of seedlings fit for planting may be reduced by 5 to 15 per cent. In the work described, cricket damage was controlled by the application of a spray of dilute nicotine solution. Six weeks after sowing the plants were 2–4 in. high and appeared to be unaffected by temperatures of 109–111° F. accompanied by a hot wind.

23.24. Formation of Stands by Planting

23.24 : 12.25 (79.5 : 79.7). MUNGER, T. T. **Instructions for planting Douglas Fir on logged-off lands of western Oregon and Washington.** Pacific Northwest Forest Experiment Station, Portland, Oregon. 1942. pp. 20.

This pamphlet is intended for the use of men engaged on tree-planting projects in the Douglas-Fir region. It contains practical instructions on the mapping of the area to be planted, the pre-planting control of animals, the suitability of land for planting, the care of seedlings, the selection and organization of the planting crew, the duties of the foreman and the superintendent, the necessary equipment, and the spacing and actual setting of the trees (one-man grub-hoe slit method).

23.24 : 12.26–8 : 22.89 : 24 : 4 : 31.8 : 56 : 57. GRIFFITH, A. L. **Teak plantation technique.** *Indian For. Rec. (n.s.) Silviculture* 5, 1942 (123–219 + plates). [Forest Research Institute, Dehra Dun.]

This is a compilation of all published information on the subject supplemented by answers to a widely circulated and comprehensive questionnaire and other unpublished data available to the author, including his own observations made during extensive tours in India and Burma. It is complementary to the publication in the same series on 'The problem of the pure Teak plantation' to which reference has to be made for details on that aspect of the subject [cf. *For. Abstr.* 4 (165–6)]. There are now over 200,000 acres of Teak plantations in India and Burma, and over 6,000 acres are being added annually. The distribution and the climatic and soil requirements of Teak are described, and the reasons for the general adoption of artificial regeneration reviewed. Nursery practice is described and the need for more care in seed collection is noted. There has been a steady extension of the use of root and shoot

stumps for planting, this method tending to displace all others. The *taungya* method is fully described, opinion differing as to its merits as compared with planting without field crops; it appears to give better results in the drier regions, but to be accompanied by some loss of height growth in the moister regions. The desirability of maintaining some form of species mixture with the Teak is discussed and the conclusion reached that the most promising line is to encourage natural undergrowth, as mixed planting and underplanting have little to recommend them. Thinning procedures are reviewed; thinning rather mechanically when the height is 25 ft. and 40 ft., and subsequent selective thinnings, heavy enough to free the crowns on all sides, are indicated as generally most suitable.

Chapter X deals with injuries and protection; opinion is summarized to the effect that good Teak plantations grow in spite of frequent defoliation. There is a brief account of the comparison of timber from plantations and natural forest, the view being taken that there is inadequate evidence for drawing conclusions as to relative quality.

There are eighteen good photographic illustrations and a map showing natural distribution, plantation centres, and the rainfall of India and Burma. H. G. C.

23.24 (67.6) : 11.49.5 : 23.21 : 11.62.21. DALE, I. R. **Planting trees in fresh-water swamps.** *E. Afr. agric. J.* 9, 1943 (23–4).

Tree plantations are cheaper and in many cases more efficient than drainage systems in dealing with swamp land and in controlling mosquitos; in addition, they supply a certain quantity of timber. The author discusses various factors relating to the establishment of plantations on swampy sites.

Fast-growing Eucalypts are generally the most suitable species for planting swamps at altitudes where termites are not troublesome. At elevations of 3,500 to 4,000 ft. in the Eastern Province of Uganda, Eucalypts are limited to the wettest areas where termitaries do not exist. *Eucalyptus saligna*, a fast-growing tree, appears to be the best species for general planting, but *E. robusta* is recommended for places liable to long periods of flooding. *Cassia siamea* appears to be the only species suitable for seepage areas where termites are likely to be troublesome. Mango, Tamarind, *Balanites aegyptiaca*, and *Cedrela toona* have some disadvantages but may also be of use in certain localities.

The commonest types of injury in swamp plantations are windthrow and root rot. As the water-table rises when a plantation is felled, felling should, if possible, take place during the dry season.

The mean annual increment of Eucalypts per acre varies from 300 cu. ft. stacked, in poorish papyrus swamps, to about 500 cu. ft. on better soils. *Cassia* can be expected to give very little return as it is usually relegated to poor seepage areas.

23.24.2. *Methods of Planting*

23.24.2 (47.1) : 12.25 : 12.26–8 : 23.52 : 45.11. HEIKINHEIMO, O. **Experiments with silvicultural planting methods.** *Commun. Inst. for. Fenn.* 29 (4), 1941 (1–63). [Finn.g.] S.P.S.

The experiments were made on a total of 264 plots, most of them planted with Spruce (*Picea abies*), all situated south of lat. 62°N. Best results were obtained by using Norwegian shallow planting and large transplants—2 + 1 transplants (roots not pruned) of Pine (*Pinus sylvestris*), Birch (*Betula* sp.), and Larch (*Larix decidua*), and 2 + 2 transplants of Spruce. Spring planting of Pine and Larch gave the best results, while spring and autumn planting of Spruce and Birch gave much the same result. Planting Spruce under shelter is recommended as long as the nurse trees are removed some 5 years after planting, when the 'brooding' period of young Spruce is over. This period, most pronounced in Spruce, less so in Larch, and little or not noticeable in Birch and Pine, is explained as the time required for a new root system to develop. Grazing by cattle and horses was found to be detrimental to reproduction, particularly to that of Birch, plantations of which were entirely ruined by cattle in a short time.

23.24.2 : 12.26–8. **Stump-planting.** *Res. Bull. For. Dep. Kenya* No. 17, 1940. pp. 3.

Experiments to discover with what degree of success oversize nursery stock in Kenya can be 'stumped' and planted out gave the following results:—(1) Stumps of *Eucalyptus* (*E. globulus*, *E. maculata*, *E. rostrata*, *E. saligna*, *E. paniculata*, *E. crebra*, *E. punctata*, and *E. melliodora*) proved a failure on dry sites. (2) Stumps of Muke (*Dombeya* sp.) grew better than transplants, but there was no advantage in using stumps of Mutati (*Polyscias kikuyuensis*?) or *Grevillea* sp. Mueri (*Pygeum africanum*) and Olive (*Olea* sp.) did not respond well to this treatment, although a survival of 46 per cent. was obtained with Mueri stumps. (3) In the moist climate of Kakamega, transplants and stumps of Burma Teak both grew well, but the latter are much simpler to raise in the nursery. (4) Mvule (*Chlorophora excelsa*) stumps also gave good results.

23.26. Plant Rearing. Nursery Practice

23.26 : 11.47.1 : 11.42.3 : 42.21. HEIKINHEIMO, O. **Experiments in tree nurseries.** *Commun. Inst. for. Fenn.* 29, 1940 (1–97). [Finn.g.] S.P.S.

Data on time and method of sowing, treatment of seedbeds, transplanting and fertilizing were obtained from two nurseries near Helsingfors. Spring sowing was found to give best results with Pine, Spruce and Birch, and fall sowing with Larch. A relatively large number of seedlings was obtained when the seed was covered lightly, e.g. 0·5 mm. of ashes over Birch seed and a few mm. (up to 8 in very dry summers) of soil over Pine and Spruce seed, and seedlings showed better development when seed was used sparingly. Watering the seedbed was generally effective if properly done, while screening was effective only on dry sites. Frost-heaving caused greatest damage to seedlings that were small and growing in dense patches.

In general, the best time for transplanting was in the spring. Transplanting two years in succession resulted in the densest root systems; with all species root growth was greatest in August. Pine, Birch and Larch were best transplanted when one year old and Spruce when two years old. Wide spacing is desirable for transplants except that it may favour loss by frost-heaving. The best 2 + 2 Spruce transplants were obtained with a spacing of 10 × 12·5 cm.

The pH of the soil is important, 5·5 probably being too low for most species. Contrary to other forest nursery crops, Birch may exhaust the soil of nutrients even more effectively than an agricultural crop. Peas (*Pisum arvense*) were found to be the best crop for green manuring, yielding over 200 kg./ha. of nitrogen in a crop. Twenty-per-cent. rather than 40-per-cent. potassium salts were used for composts. Calcium nitrate

was found to be beneficial for Pine. A moderate fertilizer gives the best results, yielding strong plants without too greatly reducing the root system. There is no purpose in using more than 200 kg. of the ordinary nitrogenous fertilizers per ha.

23.26 : 12.26–8 : 12.11.21 : 12.11.23. GRIFFITH, A. L. **Nursery data and early growth of *Cryptostegia grandiflora*.** *Indian For.* 69, 1943 (351–3). [Forest Research Institute, Dehra Dun.]

A short note on the propagation of *Cryptostegia grandiflora* from seed, and on its early growth. [Cf. *For. Abstr.* 5 (177).]

23.26.3 : 07.7. HILDEBRAND, W. H. **A machine for transplanting seedlings.** *J. For.* 41, 1943 (476–9). [Soil Conservation Service, Muskegon, Mich.]

This article describes the adaptation and operation of a celery planter for use in transplanting seedlings in forest nurseries. While it is doubtful whether the machine as at present designed could be operated satisfactorily on heavy clay or gravelly soils, it may soon replace transplant boards in many forest nurseries on sandy soils. Survival of stock transplanted by this method appears to be satisfactory; transplanting costs may be considerably reduced by the use of the planter.

23.3. *Afforestation*

23.3 : 11.62.11 : 24.4. LITTLEFIELD, E. W. **Reforestation: timber growing or land conservation? A discussion of objectives in tree planting.** *J. N.Y. bot. Gdn.* 44, 1943 (185–91). [New York State Conservation Department.]

Apart from the production of timber, afforestation can result in the following most important secondary benefits:—(1) erosion control; (2) water conservation and regulation; (3) protection of livestock and orchards by means of shelterbelts; (4) soil improvement, leading to conditions suitable for the growth of more exacting species. Individual examples are given of the value of forest plantations as shelterbelts and as anti-erosion and land-conservation measures.

23.3 : 12.26–8 : 56.02 : 13.15 : 13.2 : 34.3. GESE, E. C., and SHADLE, A. R. **Reforestation of Aspen after complete cutting by beavers.** *J. Wildlife Mgmt.* 7, 1943 (223–8). [University of Buffalo, Buffalo, N.Y.] B.A.P.

As it is desirable to maintain beavers in the Allegany State Park, New York, and as Aspen, which is their chief food, is becoming depleted in this region, investigations were made on the growth rate of this species with a view to possible reforestation. Eight years were required, on an average, for the production of the first inch of wood, but thereafter the growth rate gradually accelerated to a maximum during the production of the fourth inch of wood, for which only a little more than 4 years were required. Although 20 years is the optimum age of the tree for its complete utilization by beavers, 35 years is the optimum from the standpoint of the amount of beaver food produced. Apart from regeneration by suckers, propagation by selected cuttings is the best method for establishing Aspen in this region. Success in reforestation requires that beavers be excluded from the area until the trees are old enough to maintain them and that the trees be protected from over-browsing by deer. Even immediate afforestation would probably not greatly benefit the present beaver population as the food supplies are already so depleted that the beavers may be forced to migrate.

23.4. *Formation of Forest by Natural Succession*

23.4 (77.4) : 12.19 : 27. SMITH, N. F. **A study of the spread of forest cover into wild-land openings.** *Pap. Mich. Acad. Sci.* 28, 1942 (269–77). [Department of Conservation, Lansing, Michigan.] O.B.

Investigations undertaken in northern Michigan on the natural restocking of wild-land openings, particularly old burned-over areas of the upland soil types, indicate that the rapid natural closing-in of forest growth is no longer likely. By combining the open and poorly stocked groups in the area sampled, it was found that 15 per cent. will probably close within 25 years, 40 per cent. in 25 to 50 years, while 45 per cent. will require well over 50 years or will remain open indefinitely.

23.6. *Care of Regeneration in the Initial Stage of Establishment*

23.6 : 12.25 (54.5) : 44.1 : 43.1. KHAN, F. M. **Raising of new Chil (*Pinus longifolia*) crops.** *Indian For.* 69, 1943 (201–4).

The main factors responsible for the failure of *Pinus longifolia* crops are (1) suppression of seedlings by grasses and weeds, and (2) fire. Controlled grazing is recommended for overcoming grasses and weeds. Grass cutting should be used only when the seedlings are plainly visible. Fire hazard may be reduced by (*a*) controlled grazing, (*b*) the removal of lower branches so that tree crowns are well above the ground, (*c*) the formation of 2-ft.-wide inspection paths to enable fire fighters to move quickly, and to provide bases for counter-firing in the case of serious fires, and (*d*) controlled burning when seedlings are about 8 ft. high, following upon fairly heavy grazing for a week or 10 days. When pruning is used as a fire-protection measure it is recommended that the lower branches be removed periodically to half the height of the seedling until the bole has been cleared to a height of at least 6 ft. above ground.

24. TENDING OF STANDS AND TREES

24.2. *Thinnings*

24.25 : 12.25. LEBARRON, R. K. **Partial cutting in Black Spruce in the Lake States.** *Pap. Mich. Acad. Sci.* 28, 1942 (249–60 + plate). O.B.

Studies on the effects of partial cutting in stands of Black Spruce (*Picea mariana*) carried out at the Lake States Forest Experiment Station indicated that swamp forests in a reasonably thrifty condition could endure thinnings of 25 to 40 per cent. of their volume. Partial cutting in 65-year-old upland Black Spruce, however, resulted in very serious losses among the residual trees as a result of windthrow and drought. The gain in volume by the trees which survived was not sufficient to compensate for these losses.

24.25 : 12.25 (485). NÄSLUND, M. Den gamla norrländska granskogens reaktionsförmåga efter genomhuggning. **[Reaction after heavy thinning of old Spruce forest in Norrland.]** *Medd. Skogsförsöksanst. Stockh.* 33, 1942 (1–212). [Sw.g.]

In parts of northern Sweden and especially at the higher elevations where the ground vegetation indicates the prevalence of raw humus, there are extensive areas of very old, slow-growing Spruce forest, some of which is in very poor condition and should be clear-felled at an early date. However, it is not desirable to treat

all the forest in this way, partly because of the general scarcity of big timber and partly because these forests are practically the only source of employment for the local population in the region. Therefore a policy of restricted cutting is required.

Thinning experiments have been carried out by the author in different forest types within the area and it has been shown that the ground vegetation can be used as an indicator of the growth reaction to be expected in the residual stand after partial cutting. Present fellings are designed to remove 40 to 50 per cent. of the standing volume. Following this cutting the growth rate will increase in stands of the *Geranium, Dryopteris* and *Maianthemum* types. The forests of the *Vaccinium* type react more slowly, if at all, to the cutting.

24.5. *Pruning*

24.51 : 12.25 : 56. BARRETT, L. I., and DOWNS, A. A. **Growth response of White Pine in the southern Appalachians to green pruning.** *J. For.* 41, 1943 (507–10). [Central States Forest Exp. Sta., Columbus, Ohio.]

An experiment was undertaken to determine the effect of light, moderate and heavy pruning on the subsequent growth of Eastern White Pine (*Pinus strobus*) trees 2–7 in. d.b.h. Based on results for the first 5-year period after pruning it is concluded that:—(1) About 30 per cent. of the number of living whorls may be pruned without seriously reducing the growth rate. (2) Smooth, flush cuts without splinters or breaks are important for rapid healing and quick production of clear lumber. Pruning with the object of obtaining a clear 16-ft. log in one operation should be postponed until the trees reach such a size that pruning to 17·3 ft. from the ground will not remove more than 30 per cent. of the living whorls.

24.51 : 12.25 : 56.01–02. WIMBUSH, S. H. **Pruning of African Pencil Cedar.** *Bull. For. Dep. Kenya* No. 18, 1941. p. [1].

In an experiment to determine the effect of pruning on the height growth of African Pencil Cedar (*Juniperus procera*), trees were pruned to $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ of their total height, each tree being pruned three times—when $3\frac{1}{2}$, $5\frac{1}{2}$ and $8\frac{1}{2}$ years old. Measurements made after each successive pruning showed no significant differences in height growth although high pruning appeared to have retarded diameter growth.

3. FOREST UTILIZATION. FOREST TECHNOLOGY

31. PROPERTIES AND ANATOMY OF WOOD. WOOD RESEARCH

31 : 33.15 : 33.36.1 : 33.36.3. GREENHILL, W. L. **Recent advances in timber physics.** *Chron. bot.* 7, 1943 (358–9). [Council for Scientific and Industrial Research, Melbourne.] O.B.D.

A review of some recent developments in timber research, including advances in the seasoning and impregnation of wood and in the manufacture of 'improved' woods.

31.0. *General Information on Woods*

31.0 (67) : 98. RENDLE, B. J. **A project for a survey of the timbers of tropical Africa.** *Emp. For. J.* 22, 1943 (32–6). [Department of Scientific and Industrial Research.]

The main object of the proposed survey is to prepare a critical summary of practical information on the timbers of tropical Africa that would afford an essential background for the development of the Empire's timber resources. The author discusses the timber situation in tropical Africa with reference to the pre-war importation of softwood saw timber from Scandinavia and North America, and the possibilities of increasing the use of secondary native timbers for local purposes and, to a limited extent, for export. A useful preliminary step towards the intensive exploitation of these species would be to classify them into broad groups according to their potential uses, having in mind the general purposes for which most of the timber is required locally.

The method of making the proposed survey and of assembling the information for each timber or for groups of timber is outlined.

31.0 : 12.25. BETTS, H. S. **American woods.** U.S. Forest Service, Washington, D.C. 1942.

Two pamphlets of the series [cf. *For. Abstr.* 4 (105, 230)], each giving briefly the description, nomenclature, distribution and growth, supply, production, properties, and principal uses of one of the commercial forest trees of the United States. These pamphlets deal with Balsam Fir (*Abies balsamea*) and Sweetgum (*Liquidambar styraciflua*).

31.0 : 12.26–8. **Lignum vitae [*Guaiacum officinale* L. and *G. sanctum* L.]** *Timber Leaflet* No. 86, 1943. pp. 4. Timber Development Association, Ltd., 75 Cannon St., London, E.C. 4.

Brief notes are given on nomenclature, distribution, tree characteristics, and timber properties, uses and supplies for Lignum Vitae (*Guaiacum* spp.) and Maracaibo Lignum Vitae (*Bulnesia arborea*).

31.0 : 12.26–8. **Alerce [*Fitzroya cupressoides*.]** *Timber Leaflet* No. 85 [1943?] pp. 4. Timber Development Association, Ltd., 75 Cannon Street, London, E.C.4.

Brief notes are given on nomenclature, distribution, tree characteristics, and timber properties, uses and supplies for *Fitzroya cupressoides*.

31.0 : 12.26–8 : 21.0 : 33.54 : 33.36.1 : 33.12. SMITH, G. E. P. **Creosoted Tamarisk fence posts and adaptability of Tamarisk as a fine cabinet wood.** *Tech. Bull. Ariz. agric. Exp. Sta.* No. 92, 1941 (223–54 + plate).

The Tamarisk tree (*Tamarix aphylla*) was first introduced into Arizona from Algeria in 1911. Since then it has been propagated fairly extensively by cuttings. This species is drought resistant and does best in a hot, dry climate with strong sunlight; it is sensitive to low temperatures. The tree thrives in medium to light loam soil, and under most favourable conditions of soil and moisture can make an annual increase in height of up to 10–15 ft. and in diameter of 1 in. The wood is white, hard and heavy, with a handsome grain when sawn radially. An account is given of various experiments in treating Tamarisk posts with creosote. Five-year results indicate that home-treated posts may have a useful life of at least 12–15 years. Investigations into the possible use of Tamarisk as a fine cabinet wood are also described.

31.1. *Structure. Anatomy. Identification*

31.1. RECORD, S. J. **Keys to American woods** (continued). *Trop. Woods* No. 75, 1943 (8–26).

The eighth and ninth keys in the series [cf. *For. Abstr.* 5 (113)] are for (8) woods possessing vessels with opposite or scalariform pitting and (9) woods with conspicuous rays.

31.1 : 12.25 : 31.21.33 : 31.8. MISRA, P. **Xylem rays in relation to the eccentric rings and the spiral grain in the wood of *Pinus longifolia*, Roxb.** *J. Indian bot. Soc.* 21, 1942 (327–30 + plate). [Ravenshaw College, Cuttack.] O.B.D.

In horizontal coniferous branches, where the successive growth rings are eccentric but the widest regions are confined to the vertically lower side of the branch, the wood rays are found to be curving upwards, on the lateral sides of the branch. This may be explained by assuming that the rays form normals to the circumferences of the successive rings.

In the stem of the twisted Chir Pine the growth rings are eccentric and the widest regions of the different rings may lie on different radii. The rays are observed to take a zigzag course if the eccentricity changes sides very often, forming normals to the circumference of the successive rings. The deviation of the wood rays from their straight course through the wood seems to be correlated with the appearance of spiral grain, and its clockwise deviation tends to produce the left twist (clockwise course upwards) of fibres. Further clockwise deviation in the course of the wood rays tends to increase the left twist of the fibres, and the anti-clockwise deviation of the rays tends to decrease the left twist. *Author's summary.*

31.1 : 12.26–8. BANNAN, M. W. **Wood structure of *Ryania*.** *Amer. J. Bot.* 30, 1943 (351–5). O.B.D.

The wood of *Ryania* was studied in an attempt to discover if constant anatomical differences existed among the species. Much variation was discovered and, although slight differences seem to occur in such 'quantitative' characters as size of the cells, the intraspecific fluctuations are very wide with much overlapping among species. There are some indications that different combinations of size groupings of the various elements exist in the different species, but insufficient material was available to allow of positive statements on this point. No constant differences were observed in such 'qualitative' characters as size and structure of the rays, or shape, wall structure and pitting of the wood elements.

31.1 (54) : 33.6. GHOSH, S. S. **How to identify timbers. Part IV. Timbers for boxes and packing cases.** *Indian For. Leafl.* (*Utilisation*) No. 46, 1943 (30–59). [Forest Research Institute, Dehra Dun.]

This leaflet gives four keys (each representing a geographical zone) for the field identification of important Indian timbers used for different types of boxes and packing cases required by the Ordnance Department; brief anatomical descriptions are included for each of the timbers. [Cf. *For. Abstr.* 4 (231); 5 (113).]

31.1 (54) : 33.8. CHOWDHURY, K. A., and TANDAN, K. N. **How to identify timbers. Part V. Timbers for gun and rifle parts.** *Indian For. Leafl.* (*Utilisation*) No. 50, 1943. pp. 5. [Forest Research Institute, Dehra Dun.]

This publication includes a key for the field identification of important Indian timbers used for gun and rifle parts, and brief anatomical descriptions of the timbers which are *Juglans* spp., *Prunus puddum*, *P. padus*, *Acer* spp., *Morus laevigata*, and *Amoora wallichii*.

31.1 (54) : 33.8. CHOWDHURY, K. A. **How to identify timbers. Part VI. Timbers for camp furniture.** *Indian For. Leafl.* (*Utilisation*) No. 51, 1943 (67–73). [Forest Research Institute, Dehra Dun.]

This leaflet includes a key for the field identification of important Indian timbers used for camp furniture, and brief anatomical descriptions of the timbers which are *Grewia* spp., *Pterocarpus marsupium*, *Dalbergia* spp., *Morus alba*, *Fraxinus excelsior*, *Zanthoxylum rhetsa*, and *Anogeissus* spp.

31.1 : 33.38. WARNE, L. G. G. **English wood charcoals.** *J. Soc. chem. Ind., Lond.* 62, 1943 (88–90 + plates). L.S.

As the anatomical features of a wood are not destroyed in charcoal preparation it is possible to identify the botanical source of wood charcoals when they are in lump form. In the present article the author describes briefly certain anatomical and other features that are of diagnostic value in this connexion and gives a key, based on these characters, that can be used in the identification of English hardwood charcoals.

31.1 : 33.38. WARNE, L. G. G. **The identification of powdered wood charcoals.** *J. Soc. chem. Ind., Lond.* 62, 1943 (141–4). [University of Manchester.] P.R.

Although powdered wood charcoals include recognizable fragments of vessel wall and these fragments are perforated, the number, size, shape, and arrangement of the perforations are so variable for each species that only rarely is it possible to decide with certainty the botanical source of the charcoal. This article includes a summary of the characters of vessel wall fragments in charcoal powders derived from fifteen English hardwoods. A key is given for the identification of English wood charcoal powders.

31.2. *Physical Properties*

31.2 : 12.25–8 (94). AUSTRALIA. **Sixteenth annual report of the Council for Scientific and Industrial Research, for the year ended 30th June, 1942.** Govt. Printer, Canberra. [1943?] pp. 74.

Records, based on the systematic examination of wood specimens, have been made of the extent and influence of such features as brittle heart, reaction wood, rate of growth and percentage of latewood on the properties of Mountain Ash (*Eucalyptus regnans*), Alpine Ash (*E. gigantea*), King William Pine (*Athrotaxis selaginoides*), Blackwood (*Acacia melanoxylon*), Silver Quandong (*Elaeocarpus grandis*), Queensland Maple (*Flindersia brayleyana*) and Silver Ash (*F. pubescens*) (p. 32).

31.2 : 12.25–8 (83). TORRICELLI, E. Propiedades físicas y mecánicas de las maderas chilenas. [**Physical and mechanical properties of Chilean woods.**] Ministerio de Tierras y Colonizacion, Departamento de Bienes Nacionales (Sección Bosques). 1941. pp. 103 + plates. [Span.]

Studies on the specific weight, moisture content, fibre saturation point, shrinkage, tensile strength, resistance to compression, shear, bending strength, resistance to impact bending, and hardness of a number of Chilean timbers.

31.21. Conductivity

31.21.4. Barkas, W. W., Hearmon, R. F. S., and Pratt, C. H. **Electrical resistance of wood.** *Nature, Lond.* 151, 1943 (83). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

It is known that electrical resistance of wood increases rapidly with decrease in moisture content. The authors have found that when Beech wood, with a moisture content of 30–40 per cent., is heated to just over 100° C. in a confined space at atmospheric pressure and the space is suddenly evacuated, the resistance increased by a factor of as much as 200 : 1. Subsequent direct measurement showed that there was only a small reduction in moisture content of the wood; in addition electrical resistance was found to return gradually to something like its original value. From the observed effect it is suggested that the current path in moist wood is principally along the interior surfaces of the cells.

31.22. Relation to Water, Air, Gases

31.22 : 07.7. Narayanamurti, D., and Purushotham, A. **Studies in permeability. Part I. A preliminary note on the permeability of wood and other materials to air.** *Indian For. Bull* (*n.s.*) *Utilisation* No. 120, 1943. pp. 16 + figs. [Forest Research Institute, Dehra Dun.]

An apparatus for measuring the permeability of wood, fibre-boards, etc., to gases is described and illustrated; the clamp for holding the specimen in place is specially designed so as to avoid the end-sealing of specimens. Permeability coefficients were determined for several species of wood and for samples of fibre-boards and plywood, and the results are tabulated. The influence of various factors, such as direction of flow, species, etc., on the permeability of wood to gases is discussed.

31.22.1 : 07.7 : 33.36.3. **New contact moisture gauge does not mar surfaces.** *B.C. Lumberm.* 27 (8), 1943 (63).

Reference is made to a moisture gauge designed to register the moisture content of plywood, veneer and other thin wood products without marring the surface of the material.

31.23. Weight. Specific Gravity

31.23 : 12.26–8 : 56.02. Bethel, J. S. **Factors influencing the specific gravity of Chestnut-Oak wood.** *J. For.* 41, 1943 (599–601). [Virginia Polytechnic Institute.]

The results from the study described indicate that there is a very close relationship between the percentage of summerwood and the specific gravity of young Chestnut Oak (*Quercus montana*) wood, and suggest that the average width of the annual rings is not a good indicator of either the percentage of summerwood or the specific gravity of this type of material.

31.27. Mechanical Strength

31.27 : 07.7 : 31.8. Grondal, B. L., and Schrader, O. H. **The impact-torsion testing of aircraft lumber.** *For. Cl. Quart.* 16 (3), 1942–43 (9–16). [University of Washington.]

The results are given of an investigation into the causes for rejection of aircraft timber. It is suggested that in routine tests use should be made of an impact-torsion testing machine developed by the writers with a view to reducing the amount of waste.

31.27 : 11.11. Australia. **Sixteenth annual report of the Council for Scientific and Industrial Research, for the year ended 30th June, 1942.** Govt. Printer, Canberra. [1943?] pp. 74.

Investigations have shown that the strength properties of certain timbers increase appreciably with reduction in temperature (p. 33).

31.27 : 07.7. **Wood testing machine.** *Sth. Lumberm.* 167 (2097), 1943 (36).

A new machine has been developed by the U.S. Forest Products Laboratory for testing the toughness of wood. Such tests indicate any physical weakness in wood more accurately than is possible by density or other physical-property tests. The machine should be used in conjunction with visual inspection in order to eliminate compression wood, and diagonal and spiral grain.

31.27 : 12.25 : 56. New Zealand. **Annual report of the Director of Forestry for the year ended 31st March, 1943.** Govt. Printer, Wellington. 1943. pp. 24.

Standard tests of forest-grown Insignis Pine and European Larch timber demonstrated the marked superiority of slow-grown over fast-grown material (p. 12).

31.27 : 12.25 : 33.36.1. Thunell, B. Inverkan på furfuvirkes hållfasthetsegenskaper av basning och impregnering med vissa skyddsmedel mot röta och insekter. **[The influence of steam treatment and of impregnation with certain preservatives on the strength properties of Pine wood.]** *Medd. ProvnAnst., Stockh.* No. 83, 1941. pp. 14. [Sw.e.] P.R.

Comparable strength tests were made on clear specimens of Pine wood that were subjected to steam treatment for 5, 15, and 25 hours and impregnated with a preservative salt or creosote by various methods. The results show that the bending strength of the wood is not affected by impregnation with Boliden salt either under pressure or by the open-tank method with steam treatment at 100° C., or by pressure impregnation with creosote. However, for wood impregnated with Boliden salt by the open-tank process, the impact-bending strength of the wood decreased as the duration of the steam treatment increased; after 15 hours of steam treatment there was a decrease in strength of 5–7 per cent. The impact-bending strength of wood pressure-impregnated with Boliden salt decreased by some 15 per cent. as compared with the corresponding non-treated wood, and that of wood impregnated with creosote decreased by 15–20 per cent.

31.27 : 12.25–8 : 33.51. Great Britain. **Ministry of Fuel and Power. Twenty-first annual report of the Safety in Mines Research Board, 1942.** H.M. Stationery Office, London. 1943. pp. 23.

Bending tests of roof bars 5 ft. long and 6 in. × 3 in. in section, gave the following results.

	Average maximum strength	*Deflection in the centre*
	tons	*in.*
Ash . .	8·5	3·4
Beech . .	8·8	2·2
Oak . .	6·6	1·75
Larch . .	5·9	2·5
Scots Pine .	4·5	2·5

The Ash, Beech and Larch bars were fairly uniform in their respective maximum strengths while the Oak and Scots Pine bars differed widely amongst themselves. The Ash bars were definitely superior in residual strength and flexibility (p. 13).

31.27 : 12.26–8 (485) : 31.46. THUNELL, B. **Jämförande undersökning över vissa hållfasthetsegenskaper hos ask-, björk- och bokvirke. [Comparative investigations on certain strength properties of Ash, Birch and Beech wood.]** *Medd. ProvnAnst., Stockh.* No. 88, 1942. pp. 12. [Sw.g.e.] P.R.

In tests made with timbers of Ash, Birch and Beech it was found that the strength of these woods decreased very little and their brittleness increased slightly at a temperature of –20° C.; with decrease in temperature the 'stiffness' of the wood appeared to increase. Swedish Beech and Birch woods have greater minimum strength than Ash and may therefore compete with the latter for use in the manufacture of various wood products.

31.3. *Chemical Properties*

31.3. BAILEY, A. **Volatile hydrogenation derivatives of lignin.** *J. Amer. chem. Soc.* 65, 1943 (1165–8). O.R.S.

Eight low-boiling hydrogenation products of lignin were separated and identified.

31.3. WEST, K. A., and HIBBERT, H. **Studies on lignin and related compounds. LXIV. Synthesis and properties of 3-hydroxy-1-(4-hydroxy-3-methoxyphenyl)-1-propanone.** *J. Amer. chem. Soc.* 65, 1943 (1170–2). O.R.S.

31.3. HEWSON, W. B., and HIBBERT, H. **Studies on lignin and related compounds. LXV. Re-ethanolysis of isolated lignins.** *J. Amer. chem. Soc.* 65, 1943 (1173–6). O.R.S.

31.3 : 12.26–8. WEST, E., MACGREGOR, W. S., EVANS, T. H., LEVI, I., and HIBBERT, H. **Studies on lignin and related compounds. LXVI. The ethanolysis of Maple wood.** *J. Amer. chem. Soc.* 65, 1943 (1176–80). O.R.S.

31.3 : 12.26–8. KULKA, M., and HIBBERT, H. **Studies on lignin and related compounds. LXVII. Isolation and identification of 1-(4-hydroxy-3, 5-dimethoxyphenyl)-2-propanone and 1-(4-hydroxy-3-methoxyphenyl)-2-propanone from Maple wood ethanolysis products. Metabolic changes in lower and higher plants.** *J. Amer. chem. Soc.* 65, 1943 (1180–5). O.R.S.

31.3. KULKA, M., and HIBBERT, H. **Studies on lignin and related compounds. LXVIII. Synthesis and properties of 1-ethoxy-1-(4-hydroxy-3-methoxyphenyl)-2-propanone, 3-ethoxy-1-(4-hydroxy-3-methoxyphenyl)-2-propanone and their methyl ethers.** *J. Amer. chem. Soc.* 65, 1943 (1185–7). O.R.S.

31.3 : 12.25. WEST, E., MACINNES, A. S., and HIBBERT, H. **Studies on lignin and related compounds. LXIX. Isolation of 1-(4-hydroxy-3-methoxyphenyl)-2-propanone and 1-ethoxy-1-(4-hydroxy-3-methoxyphenyl)-2-propanone from the ethanolysis products of Spruce wood.** *J. Amer. chem. Soc.* 65, 1943 (1187–92). O.R.S.

31.3 : 12.26–8. BOWER, J. R., COOKE, L. M., and HIBBERT, H. **Studies on lignin and related compounds. LXX. Hydrogenolysis and hydrogenation of Maple wood.** *J. Amer. chem. Soc.* 65, 1943 (1192–5). O.R.S.

31.3 : 12.25 : 12.11.11 : 12.14.5. BOWER, J. R., COOKE, L. M., and HIBBERT, H. **Studies on lignin and related compounds. LXXI. The course of formation of native lignin in Spruce buds.** *J. Amer. chem. Soc.* 65, 1943 (1195–8). O.R.S.

31.3 : 12.25–8. DAUPHINÉ, A. **The localization of lignin in the plant membrane.** *Compt. rend.* No. 213, 1941 (739–40). *Chem. Zbl.* I, 1942 (2414). Chem. Abstr. 37 (4097). P.R.

Studies were made on the lignified parenchyma from the pith of *Clematis vitalba* and on the mechanical elements of the secondary vascular cylinder of *Euonymus japonicus* and *Pinus sylvestris*. Tests for lignin (phloroglucinol, aniline sulphate) and cellulose (I solution, fuming HI) showed these elements to be made up of alternate layers of lignin and cellulose. If the sections were first treated with NaOCl solution, the lignin tests were negative, but a blue colour was obtained in tests for cellulose, with a pale-appearing middle lamella. With a combined treatment with ruthenium red and Schweitzer's reagent the middle lamella is shown to be made up of an intimate inter-weaving of pectin and lignin substances.

31.3 : 12.26–8. AUSTRALIA. **Sixteenth annual report of the Council for Scientific and Industrial Research, for the year ended 30th June, 1942.** Govt. Printer, Canberra. [1943?] pp. 74.

The chemistry of Eucalypt lignin is being investigated and a number of methods have been used for isolating lignin from the wood. Both melting points and molecular weights have been used in an effort to characterize the lignins (p. 32).

31.4. *Durability. Decomposition*

31.41. Natural Durability

31.41 : 12.25 : 31.23. SOUTHAM, C. M., and EHRLICH, J. **Decay resistance and physical characteristics of wood.** *J. For.* 41, 1943 (666–73). [University of Idaho, Moscow, Idaho.]

Studies of leached heartwood and of leached and unleached sapwood of Western Red Cedar (*Thuja plicata*) showed no significant influence of either specific gravity or ring frequency on susceptibility to decay, but did indicate that leached heartwood decays more rapidly than sapwood, and unleached sapwood more rapidly than leached sapwood.

31.41 : 12.25–8 : 33.54. MUNTZ, H. H. **A fence post service test in the Mississippi Delta.** *J. For.* 41, 1943 (524–6). [Southern Forest Exp. Sta.]

A service test of fence posts of various species, using both treated and untreated, and round and split posts, was established near Stoneville, Mississippi in 1937. The present progress report deals only with untreated posts; these were examined in November, 1941. The circumference of the posts varied from 13 to 17 in., averaging 14 in. for round posts and 16 in. for split posts. In 1941 the percentages of serviceable posts, including 'mostly sound' and 'somewhat deteriorated', by species, were:—Osage Orange (*Maclura pomifera*) 100; Black Locust (*Robinia pseudoacacia*), hill-grown, 91; Red Mulberry (*Morus rubra*) 89; Black Locust, delta-grown, 73; Bald Cypress (*Taxodium distichum*) 44; Honey Locust (*Gleditsia triacanthos*) 26; and Overcup Oak (*Quercus lyrata*) 23. Most of the posts of Bald Cypress were cut from young second growth of the less durable 'yellow upland' variety and the posts of Overcup Oak and Honey Locust consisted mostly of sapwood. There was little difference in results in relation to season of cutting, whether posts were split or round, and whether they were set in a swampy or relatively well-drained site.

31.42. Attack by Plant Organisms

31.42.11 : 33.8. Boyce, J. S., and Hepting, G. H. **Decay of wood in aircraft.** *For. Pathol. spec. Release U.S. Dep. Agric.* No. 12, 1943. pp. 4. P.R.

This report is based on the examination of interior members of older aeroplanes with framework constructed partly or completely of wood covered with fabric, and of more recent plywood planes, mostly after 1–2 years' service, and on laboratory studies of specimens suspected of decay. From this study it is concluded that, so far as decay is concerned, wood has given very good service in aeroplane construction. However, if all decay is to be avoided, new designs should aim at keeping the wood as dry as possible. Specific recommendations on these lines are given with respect to construction and maintenance.

31.42.11 : 12.25 : 12.21 : 31.3. Rennerfelt, E. Die Toxizität der phenolischen Inhaltsstoffe des Kiefernkernholzes gegenüber einigen Fäulnispilzen. **[The toxicity of the phenolic ingredients of Pine heartwood to some rot fungi.]** *Svensk bot. Tidskr.* 37 (1), 1943 (83–93). R.A.M. 22, 1943 (282–3).

The phenolic substances, pinosylvin and pinosylvin monomethylether, occurring in Pine heartwood, were tested in malt agar cultures at 22° C. for their fungicidal properties, and were found (the former in particular), to exert a strongly toxic action on certain wood-destroying fungi. Thus, a concentration of 0·01 per cent. pinosylvin was sufficient to arrest the growth of *Polyporus betulinus* and *Polystictus hirsutus*, while *Schizophyllum commune* was somewhat more resistant, developing to a slight extent in the presence of 0·02 per cent. of the phenol; *Fomes annosus* succumbed only to a dosage of 0·1 per cent. Pinosylvin itself was about 20 times as toxic to *F. annosus*, *P. hirsutus*, and *S. commune* as its monomethylether, whereas *Polyporus betulinus* was equally sensitive to both substances. The phenol coefficient of pinosylvin is 5 to 10 times that of the monomethylether. Pine heartwood blocks impregnated with the latter were much less severely attacked by *Lentinus squamosus* than the untreated controls, but in the case of *F. annosus* little difference was observed between the two series.

31.42.11 : 12.26–8 : 12.21. Lutz, L. Sur l'attaque du bois par les Hyménomycètes lignicoles. Cas du *Daedalea quercina*. **[On the infection of wood by lignicolous Hymenomycetes. The case of *Daedalea quercina*.]** *Boissiera* No. 7, 1943 (293–5). [F.] R.A.M. 22 (334).

During the period between 28th March, 1939, and 28th July, 1942, a sample of Beech wood exposed to contact with a culture of *Daedalea quercina* from Oak under controlled conditions of excessive humidity underwent conversion into a translucid mass. As in the case of *Coriolus* (*Polystictus*) *versicolor* on the same substratum, the process of disorganization was initiated by hydrolysis of the lignin component, followed by disintegration of the cellulose and ultimately of the middle lamella.

31.43. Attack by Animal Organisms

31.43 : 13.2. Linsley, E. G. **Delayed emergence of *Buprestis aurulenta* from structural timbers.** *J. econ. Ent.* 36, 1943 (348–9). [University of California.]

The author cites recorded cases of the emergence of golden buprestids (*Buprestis aurulenta* Linn.) from structural wood long after the wood had been finished and put in place. Although *B. aurulenta* may oviposit on green lumber and on exposed timbers, there is no reliable evidence that the species will oviposit on finished wood. The emergence of the buprestid from such timbers seems therefore to prove that the species is capable of prolonged existence in seasoned wood.

31.43 : 13.2 : 38.1. Johnston, H. R. **Laboratory tests of termite shields.** *J. econ. Ent.* 36, 1943 (386–92). [U.S. Bureau of Entomology and Plant Quarantine.]

In order to determine the fundamental principles which influence the effectiveness of termite shields, laboratory tests were carried out with shields of different types under conditions favouring optimum activity of the eastern subterranean termite, *Reticulitermes flavipes*. Certain of the factors studied, in particular smooth surfaces, thin edges, and a downward angle of 90°, increased the value of the shield, but no combination of these factors was sufficient entirely to prevent tube construction. Since in over 70 per cent. of the cases the termites did not build tubes to the edge of shields which projected 2 in. from the piers, and since neither added width nor the 45° angle downward greatly influenced the effectiveness of the shields, it is believed that a simple flat or horizontal shield of 26-gauge galvanized iron which projects 2 in. from the foundation would afford as much protection as the standard 45° types previously recommended, besides being easier and cheaper to install. Periodic inspection is necessary in order to check the development of termite tubes across the shield, which serves the useful purpose of forcing the termites into the open. Infestation may be controlled by repeatedly breaking the tubes from the shield until activity ceases.

31.45. Injury by Fire

31.45 : 12.25–8 (54) : 31.1–2. Narayanamurti, D., and Gopalachari, R. **Studies in fire resistance. Part I. The fire resistance of some Indian timbers. (a) The rate of burning.** *Indian For. Bull. (n.s.) Utilisation* No. 118, 1943. pp. 17 + figs. [Forest Research Institute, Dehra Dun.]

Results are given of experiments on the rate of burning of 52 species of Indian timbers varying in density from 0·28 g./cm.^{3} to 1·28 g./cm.^{3}; these species are grouped according to their resistance to fire. The bulletin also includes a discussion of the experimental method used, and of the influence of various factors such as the structure and physical properties of wood on its natural resistance to fire.

31.8. *Quality and Defects of Timber*

31.8 : 12.25 : 31.2 : 31.3. Wegelius, T. **The presence and properties of knots in Finnish Spruce.** *Acta for. fenn.* 48, 1939 (1–191). [E.] S.P.S.

The significance of various types of knots in sawn timber and in pulpwood is fully discussed, and illustrations (mostly from German and Finnish literature) are given of the origin, development and occurrence of knots in stands under various types of management. Natural pruning appears to be generally more rapid in forest types of medium site quality. Stemwood and branchwood are compared anatomically and by X-ray analysis, and their mechanical and chemical properties are fully discussed, new data being presented on:—contents of lignin, cellulose, pentosans, ether-soluble substances, and ash; resistance to water, HCl, and

NaOH; density; compressive and breaking strength; cleavability; resistance to cross-grain tension; and hardness. The percentage of summerwood, or of compression wood in branches, was found to be closely correlated to most other characteristics, and the percentage of summerwood correlated to the width of the annual ring.

32. HARVESTING OF WOOD. LOGGING

32 : 81 : 07.7. ANDERSEN, S., and IHLEN, N. N. Håndbok for huggere. **[Handbook for lumberjacks.]** Det norske Skogselskap, Oslo. 1941. pp. 68. [Nor.] N.D.A.

This book is published by Det norske Skogselskap in the series 'Skogsarbeid idag' (Forest Work To-day). The following are the chapter headings:—(1) The use and care of the axe; (2) the barking spade; (3) the use and care (filing) of the saw; (4) other tools; (5) notes on felling; (6) logging accidents; (7) first-aid treatment; (8) the log cabin; (9) food for forest workers; (10) clothes for forest workers. With 96 illustrations the book is a good guide for forest workers, especially for novices. Some of the illustrations and contents are from Swedish and Finnish literature.

The efficiency of the worker will increase by 16 to 50 per cent. in using first-class tools. Reference to Swedish investigations shows that the time used in logging operations is divided as follows in percentages for each of the individual items:—felling 14, stripping (lopping) 22, bark peeling 45, cross-cutting 10, walking between trees 3, trimming the logs 3, moving the logs 2, measurement 1.

The premium for accident insurance in Norway is 6 per cent. for forestry work, while the average for other trades is 1·93 per cent. FINN FROST.

32 : 07.7 : 60.31.2. TELFORD, C. J. **Equipment and methods for harvesting farm woodland products.** *Fmrs.' Bull. U.S. Dep. Agric.* No. 1907, 1942. pp. 25. [Forest Products Laboratory, Madison, Wis.]

A semi-popular, illustrated account of methods of operation and of the tools and equipment used in harvesting logs, poles, posts, ties, fuelwood, etc. Notes are included on the sharpening of cross-cut saws, the air-drying of lumber, and the control of blue stain and checking in logs.

32.2. *Felling and Related Operations*

32.29.1 : 24.31 : 97.3. MCCORMICK, L. E., and BOWEN, C. M. **Answers to some common questions on clearing timbered land.** *Circ. Mo. Coll. Agric.* No. 425, 1940. pp. 8.

This publication includes information on methods for killing trees and sprouts. Instructions are given for preparing and applying a sodium arsenite solution for poisoning trees. It is recommended that wooded pasture should never be clear-cut, but that sufficient trees should be retained to shade approximately 50 per cent. of the ground so as to provide shade for livestock, reduce sprouting, and help maintain the grass cover.

32.29.1 (485). Stubbrytningen äter aktuell. Bristen på smörjoljor har gjort stubbtjäran efterfrågad. **[Stump removal again to the fore. The lack of lubricating oils has created a demand for stump tar.]** *Skogen* 28, 1941 (320–4). [Sw.]

Stumps are being removed from forests on a large scale in many parts of Sweden. In the Lyksele district there are approximately 25,000 ha. of Pine forest with stumps from a felling of about 50 years ago. The stumps now available cannot be considered a renewable resource, as modern forestry practice does not produce trees of such large dimensions or permit the leaving of such high stumps.

A source of 100,000 cu. m. stacked measure of stumps is considered to be worth working. Equipment used in stump grubbing includes tractors and a stump remover that can be carried by two men. A certain amount of injury to growing trees is unavoidable in this operation; tractors in particular destroy some plants and injure thin-barked trees. In the operations discussed it was found that Pine formed a tap-root only on very hard and compact moraine soils.

32.8. *Grading and Storage of Wood in the Rough*

32.81 : 31.8 : 12.26–8. BENSON, A. O., and WOLLIN, A. C. **Grading northern hardwood logs.** Forest Products Laboratory, Madison, Wis. 1941. pp. 44 + plates + graphs.

On the basis of the investigations described, standard rules are proposed for grading logs of Sugar Maple, Red Maple, Yellow Birch, American Elm, Beech, Basswood, Northern Red Oak, and White Oak. [Cf. *For. Abstr.* 3 (315–6).]

32.82 : 33.06. RIBERS, U. Vedens rätta vård. **[Proper care of wood.]** *Skogen* 29, 1942 (223–5). [Sw.]

Wooden silos are recommended for the storage of large quantities of wood, particularly of producer-gas wood. R. P. J.

33. CONVERSION AND PRESERVATION OF WOOD

33.0. *Utilization Categories of Wood*

33.0 : 31.2. BROWN, N. C. **Wood—the most important raw material of the future.** *Mech. Engng.* 65, 1943 (182, 196). [New York State College of Forestry at Syracuse Univeristy.] O.R.S.

A brief discussion of the many new uses for wood and of the important relationship between wood properties and efficient utilization.

33.0 (931) : 12.26–8 : 12.25. NEW ZEALAND. **Annual report of the Director of Forestry for the year ended 31st March, 1943.** Govt. Printer, Wellington. 1943. pp. 24.

Developments in the utilization of minor species include the use of Tawa (*Beilschmiedia tawa*) for furniture in place of Japanese Oak and as a substitute for Ash in non-shock handles, and for Mahogany in instrument tripods; the use of Pukatea (*Laurelia novae-zelandiae*) for wedge-heels and clog-soles; Rewarewa (*Knightia excelsa*) for turned products; Mangeao (*Litsaea calicaris*) for handles and jack stocks; Tanekaha (*Phyllocladus trichomanoides*) for ladders, printers' blocks and sweep-teeth; and Alder (*Alnus glutinosa*) for clog-soles (p. 12). Of various woods tested for use as wooden stoppers for water bottles, wide-ringed, low density wood of *Pinus insignis* gave the best results; this was softened by boiling in caustic soda followed by immersion in glycerine and paraffin (p. 13).

33.06. Fuelwood (including Firewood, Charcoal Wood, and Producer Wood)

33.06 : 98.1 (73). HALL, R. T., and DICKERMAN, M. B. **Wood fuel in wartime.** *Fmrs.' Bull. U.S. Dep. Agric.* No. 1912, 1942. pp. 22.

This bulletin discusses the various uses of wood as a fuel, the sources of supply, and the production, marketing and purchasing of wood fuel in the United States.

33.06 (485) : 34.6 : 12.25. Riset som bränsle. Gammalt problem, som dyker upp på nytt. **[Brushwood as fuel. An old problem which crops up again.]** *Skogen* 28, 1941 (334). [Sw.]

If transport facilities are favourable it may be worth while using the thick branches and scrub from felled stands for fuel. As a rule Spruce branches yield a fuel of higher heating value per unit weight than trunk wood. Coarse Spruce loppings make a good producer-gas wood.

33.06 : 33.36.3 : 07.7. Torkning av gengasved. **[Drying of producer gas wood.]** *Skogen* 28, 1941 (338–9). [Sw.]

Based on comprehensive experiments and practical experience over a considerable period, present requirements for producer-gas wood specify 10–15 per cent. moisture content. A modern drier for such wood, manufactured by the Svenska Fläktfabrik, is described and illustrated. It is powered by a 2-h.p. motor and has a drying capacity of 40–60 hl. per 24 hours. The drier makes use of the hot gases from a stove fire and does not include a water circulating system.

33.06 : 07.7. Specialyxa för klyvning av gengasved. **[Special axe for splitting producer wood.]** *Skogen* 29, 1942 (114). [Sw.]

The work of splitting the wood is greatly facilitated if the axe is equipped with an extra blade placed at an angle to the ordinary one.

33.06. Värmebehandlad ved som gengasbränsle. **[Wood subjected to heating as producer gas fuel.]** *Skogen* 29, 1942 (210). [Sw.]

Treatment consisted in drying and heating the wood to a temperature of 250° C. Tests of treated and untreated wood showed that by treatment the carbon content was increased from 51·0 to 55·6 per cent., the hydrogen content was reduced from 6·2 to 5·9 per cent. and the oxygen content from 42·8 to 38·5 per cent. The effective heating value was increased from 4,565 to 4,915 kcal./kg. R. P. J.

33.1. *Mechanical Conversion excluding the Manufacture of Mechanical Pulp*

33.13. Cooperage. Shingles

33.13. **Wooden tank cars.** *Timberman* 44 (9), 1942–43 (32–3).

Wooden tank cars for use in the transport of fuel oil and petrol consist of a wooden stave tank, steel-lined, 32 × 8 ft., with a capacity in excess of 10,000 gal.

33.13 : 12.26–8 (66.7). GOLD COAST COLONY. **Report on the Forestry Department for the year 1942–43.** Govt. Printing Department, Accra. 1943. pp. 5.

Timbers that have proved satisfactory in barrel manufacture include *Chlorophora excelsa, Guarea cedrata* and *Cistanthera papaverifera.* Wood of *Lovoa klaineana, Entandrophragma cylindricum* and *Piptadenia africana* were found to bend sufficiently for use as staves (p. 2).

33.15. Manufacture of Veneers and Laminated Wood. Gluing

33.15. LAIN, A. E. **Composite wood structures embodying synthetic resins.** With discussion. *Repr.* from *I.P.I. Trans.* June, 1943. pp. 41. P.R.

The author discusses the composition and properties of various synthetic glues and the factors involved in their application in the improvement of wood and wooden structures.

33.15. NARAYANAMURTI, D., and SINGH, K. **Preliminary studies on improved wood. Part II. Laminated wood.** *Indian For. Leafl.* (*Utilisation*) No. 45, 1943. pp. 7 + dgms. [Forest Research Institute, Dehra Dun.]

In this leaflet the author presents the results of experiments made to determine the influence of factors such as thickness of veneer and angle of lamination on the properties of the improved material. The species used in these experiments were *Bombax malabaricum, Zanthoxylum rhetsa* and *Michelia champaca.* The uses for laminated wood are indicated.

33.15. WILLIAMS, E. T. **The co-application of wood and plastics.** *For. Chron.* 19, 1943 (169–71). [University of Toronto.]

The author discusses briefly the history of plywood, the types of adhesives used, the theory of adhesion, and processes used in plywood construction, and lists the advantages of plywood in contrast with thin metals for fuselage, wings, or skin covering for aircraft.

33.15. NARAYANAMURTI, D., and RANGANATHAN, V. **Studies on adhesives. Part IV. Further note on prolamin adhesives.** *Indian For. Leafl.* (*Utilisation*) No. 40, 1943. pp. 14 + dgm. [Forest Research Institute, Dehra Dun.]

Water-resistant prolamin adhesives can be prepared by adding to a 20-per-cent. suspension of prolamin in 80 per cent. alcohol, 5 per cent. of formaldehyde. One per cent. of ammonia or organic acids, such as acetic, tannic, etc., may be added as a catalyst. The adhesive suspension so prepared should be applied within 24 hours of its preparation.

Veneers coated with these adhesives, after drying at room temperature, should be pressed together at a temperature of 250–300° F. for a suitable period (10 minutes for $\frac{3}{16}$-in. plywood) at a pressure of 200 lb./sq. in. *From authors' summary.*

33.15. NARAYANAMURTI, D., RANGANATHAN, V., and ROY, D. C. **Studies on adhesives. Part VI. Preliminary note on the use of sunn hemp seed proteins as plywood adhesives.** *Indian For. Leafl.* (*Utilisation*) No. 52, 1943. pp. 5. [Forest Research Institute, Dehra Dun.]

Tests have shown that certain glues made with the whole meal of sunn-hemp (*Crotalaria juncia*) seed are suitable for the production of commercial plywoods that do not require a high degree of water resistance, and that glues using the proteins of sunn-hemp seed are suitable for use in water-resistant plywood.

33.15. **New type glue: adhesive developed by Du Pont both thermoplastic and thermosetting.** *Sth. Lumberm.* 167 (2097), 1943 (38).

A new adhesive developed by Du Pont Co. for use in moulded plywood construction is initially thermoplastic, becomes permanently tough, heat resistant and insoluble, is flexible at low temperatures, and weighs almost one-quarter less than other suitable materials. It is available for military use only.

33.15. NARAYANAMURTI, D. **Improved wood.** *Indian For.* 69, 1943 (314–22 + plates).

A review of recent methods of producing wood with improved properties. The main types of 'improved'

wood discussed are:—(*a*) compressed wood, (*b*) wood impregnated with synthetic resins, (*c*) laminated wood (including lamination at various angles), and (*d*) compregnated wood. Compregnated wood, which can be produced by a suitable combination of impregnation, lamination and compression, is known to have good electrical, thermal, moisture, and fire-retardant properties in addition to increased strength. By varying the species of wood, the thickness and direction of the veneers, and the pressure and temperature of the treatment, the properties of the resulting material can be made to suit particular requirements. Compregnated wood is an ideal material for aircraft-propeller blades and for gear wheels.

33.15 : 12.25–8 : 31.27. NARAYANAMURTI, D., and SINGH, K. **Preliminary studies on improved wood. Part I. A study of the impregnation of wood with resins.** *Indian For. Leafl.* (*Utilisation*) No. 42, 1943. pp. 15 + graph. [Forest Research Institute, Dehra Dun.]

Results from the experiments described in this publication indicate that it is possible to improve the strength properties of inferior types of wood by impregnation with synthetic resins and other substances. Impregnation with resins is found to increase the density and compressive strength of the wood. The materials used in the experiments included:—(*a*) phenol-formaldehyde, cresol-formaldehyde, and xylenol-formaldehyde resins, shellac solutions, rubber latex, prolamin-formaldehyde, cashew-shell oil and groundnut protein-formaldehyde; and (*b*) the timbers *Moringa pterygosperma*, *Erythrina suberosa*, *Anthocephalus cadamba*, *Pinus longifolia*, *Acacia arabica* and *Endospermum malaccense*.

33.15. MUHLENBRUCH, C. W. **Delamination tests of plywood and a proposed specification.** *Repr.* from *Trans. Amer. Soc. mech. Engrs.* April 1943. pp. 5. P.R.

In order to overcome drawbacks of the standard test to determine delamination of plywood, which is dependent upon visual examination of a sample which has been subjected to a standard manner of soaking, the author has conducted tests designed to show that an actual physical test for modulus of rupture or modulus of elasticity will provide a quantitative measure of loss in strength due to wetting, and consequent delamination. Such a test is demonstrably far superior to the qualitative visual test now in use to forecast the ability of a plywood to withstand atmospheric exposure. As a result of the tests, the author proposes that a specification which is outlined in the paper be made a part of the delamination test for plywood. *Author's summary.*

33.15 : 12.26–8 (66.7) COX, H. A. **Tests on Empire timbers.** *Emp. For. J.* 22, 1943 (63).

In testing the peeling properties of *Combretodendron africanum* from the Gold Coast, it was found that the wood exuded an appreciable quantity of gum and that veneers split excessively while drying. The wood is considered unsatisfactory for plywood manufacture.

33.15 : 12.26–8 : 31.27. AUSTRALIA. **Sixteenth annual report of the Council for Scientific and Industrial Research, for the year ended 30th June, 1942.** Govt. Printer, Canberra. [1943?] pp. 74.

Bending tests of various Australian timbers showed Mountain Ash (*Eucalyptus regnans*) to be the best species for use in laminated-felloe construction; the wood is used in thin laminations that are built up with a cold glue (p. 34).

33.15 : 31.2. **New impregnating method.** *Sth. Lumberm.* 167 (2097), 1943 (50).

A new process developed by Pluswood, Inc., Oshkosh, Wisconsin, produces a resin-impregnated, high-density plywood, which is half the weight of aluminium, as strong as many metals, unaffected by extremes of temperature, impervious to mild acids, and non-inflammable.

33.15 : 31.2. NICHOLS, W. **Plywood and plastics.** *Flight* 44, 1943 (99–102, 119–22, 150–4, 174–5). L.S.

A detailed account is given of the various processes used in modern plywood construction, and of the properties and characteristics of the adhesives and principal woods used for this purpose. Information is also given on strength properties of plywood, the relation of moisture content to these and other factors, and on recent developments in the use of plywood.

33.15 : 31.27 : 33.8. PARSONS, G. B. **Strength characteristics of plastic-bonded plywood.** *Trans. Amer. Soc. mech. Engrs.* 65, 1943 (1–7). L.S.

This paper explains some of the more important advantages of plastic-bonded plywood and presents some of the pertinent basic-strength characteristics. The prediction is made that in the near future a thin metal covering glued to a plywood core will be used to great advantage in aeroplanes having high wing loadings. Such construction will combine the axial strengths of the metals with the good buckling characteristics of the thicker plywood construction. *From author's summary.*

33.15 : 31.27. JERVIS, A. E. L. **Resin laminated densified wood.** *Plastics* 7, 1943 (122–7). L.S.

Some of the uses of resin laminated densified wood are listed and data are given on its mechanical properties.

33.15 : 31.27. OBERG, T. P., SCHWARTZ, R. T., and SHINN, D. A. **Plastics: mechanical properties.** *Modern Plastics* 20 (8), 1943 (87–100, 122–8). Brit. Cotton Ind. Res. Ass. Summ. 23 (395). P.R.

An account is given of investigations of the static tensile, compressive, stiffness and bending properties, and the fatigue characteristics of a number of thermoplastic and thermosetting plastic materials at temperatures of –38°, 0° and 78° F. Test procedures are described, and results are shown in tables and graphs. The specific gravity of the materials ranged from 0·54 for plastic-bonded plywood to 1·38 for compressed, resin-bonded laminated wood. The laminated phenolic thermosetting plastics, paper and fabric bases, the resin-bonded plywood and the resin-bonded laminated wood, both compressed and natural or non-compressed, developed the higher specific strengths, with low elongation. In general, with decreasing temperature the static strength properties, modulus of elasticity, proportional limit, yield strength and ultimate strength increase, and the elongations and impact strengths decrease. This effect is very marked for thermoplastic materials, and there is much less effect on thermosetting plastics, the ultimate strength increasing only slightly. Plastic-bonded wood is also very little affected by low temperatures. The data on fatigue properties indicate that plastics in general are not adversely affected by low temperatures. The thermoplastic materials showed a

greater increase in fatigue strength at low temperature than the thermosetting plastics.

33.15 : 31.27 : 07.7. **Testing plywood panels in shear.** *Veneers and Plywood* 37 (6), 1943 (21). P.R.

Reference is made to a device, manufactured by Streeter-Arnet Co., Chicago, for use in testing a specimen of plywood under diagonal loads either in tension or in compression.

33.15 : 31.27 : 12.25. SCHRADER, O. H. **The effect of grouped scarf joints in clear, laminated, glued beams of Douglas Fir and Sitka Spruce.** *Timberman* 44 (9), 1942–43 (49–50, 52, 54, 57). [University of Washington.]

Tests were made on small, clear, laminated Douglas Fir and Sitka Spruce beams, some of which contained grouped scarf joints in each lamination. The beams were fabricated from aircraft grades of lumber and in accordance with aircraft specifications as to glues, assembly and conditioning. Results of static and impact bending tests on jointed beams and controls are tabulated. The tests showed that the reduction in the modulus of rupture resulting from various patterns of grouped scarf joints was relatively small, ranging from less than 1 per cent. to a maximum of about 10 per cent. in the specimens tested. The type of failure in the beams containing multiple scarf joints is described.

33.15 : 33.36.1. ANDERSON, R. B. **Finishes for plywood in the aircraft industry: types and application.** American Society of Mechanical Engineers. 1943. pp. 22. P.R.

33.15 : 33.8. KLEMIN, A. **Plywood aircraft.** *Wood* 8, 1943 (217–21). [New York University.]

The author discusses various problems and difficulties relating to the use of plywood in aircraft construction.

33.15 : 38.2. RISHELL, C. A. **Glued ship timbers have arrived.** *Sth. Lumberm.* 167 (2096), 1943 (35–6).

The author gives a brief account of the progress that has been made in the glue laminating of large timbers for ship construction. The advantages of this method are noted.

33.15 : 38.2. **Plywood I-beams for sections of prefabricated arch.** *B.C. Lumberm.* 27 (8), 1943 (61).

Brief reference is given of an experimental building, 40 ft. × 80 ft., constructed with a series of prefabricated arches having a 40-ft. span. The arches are made of plywood I-beam sections and plywood webs, and covered with plywood panels. Tests have proved them capable of carrying more than 140 lb. per sq. ft. of roof area.

33.17. Sawmilling

33.17. HORDERN, R. H. **Technical developments in saw milling—I. The educational aspect. II. Converting timber. III. Machined woodwork.** *Timb. Tr. J.* 165, 1943 (544–5, 594–5); 166, 1943 (261–2).

33.19. Other Forms of Mechanical Conversion

33.19 : 12.25 : 12.26–8. PUNTAMBEKAR, S. V., and KRISHNA, S. **Wood flour for dry electric cells.** [*Indian*] *For. Bull.* (*n.s.*) *Chemistry* No. 101, 1942. pp. 4. [Forest Research Institute, Dehra Dun.]

The qualities required in wood flour for use in dry battery cells are discussed; a flour prepared from the woods of *Abies pindrow* and *Bombax malabaricum* has been tested for this purpose in India and has now been adopted in the manufacture of battery cells.

33.3. *Chemical Treatment*

33.32. Pulp and Paper Manufacture. Plastics

33.32. MCKEE, R. H. **Recovery of cellulose and lignin from wood.** *U.S. Patent* No. 2,308,564, Jan. 19, 1943. Chem. Abstr. 37 (3939). P.R.

33.32. RUNKEL, R. Über die Vorhydrolyse von Holz und anderen Pflanzenstoffen zur Gewinnung von veredeltem Zellstoff und Nebenprodukten. [**On the pre-hydrolysis of wood and other plant materials for the production of refined cellulose and by-products.**] *Papierfabrikant* 40, 1942 (49–53). [G.] P.R.

A review of the principal German literature on prehydrolysis, using weak acids, and of the more important patents issued.

33.32 : 12.21. RENNERFELT, E. **Chemical treatment of wet mechanical pulp in order to control damages caused by fungi.** *Svenska SkogsvFören. Tidskr.* 39, 1941 (19–94). [E.sw.]

Laboratory tests on malt extract agar and on pulp have been carried out with a number of chemicals. Several bluing and wood-rotting fungi, moulds and yeastlike fungi were used in these tests. Best results were obtained with compounds containing ethylmercurychloride (Lignasan, Pulpasan). With these chemicals it was possible to check the growth of the fungi to a considerable extent in pulp manufactured at the mill. The cost of the treatment was about one Swedish crown per ton of pulp.

33.32 : 12.25. **New non-critical plastic from Redwoods.** *Sth. Lumberm.* 167 (2099), 1943 (50).

Reference is made to the discovery and development of a phenolic-type thermoplastic derived from the phlobaphenes within the cell structure of Redwood timber (*Sequoia sempervirens*). The plastic is available in large quantities and is used in the production of many articles formerly manufactured from hard rubber and other thermosetting plastic compounds.

33.32 : 12.29. BHARGAVA, M. P., and SINGH, C. **Interim report on the manufacture of kraft paper from bamboos.** *Indian For. Bull.* (*n.s.*) *Utilisation* No. 112, 1941. pp. 13 + specimens. [Forest Research Institute, Dehra Dun.]

Experiments undertaken at the Forest Research Institute, Dehra Dun, have established the suitability of bamboo as a raw material for the manufacture of kraft paper and have led to the pioneering of the industry in India. Data are given to compare the properties of sheets prepared from bamboo pulp and from Swedish kraft pulp.

33.32 : 31.3 : 12.25. ATCHISON, J. E. **Influence of cooking and bleaching upon the chain length distribution of the carbohydrate fraction in pulpwood.** *Paper Tr. J.* 116 (22), 1943 (23–34). P.R.

33.32 : 34.6 : 31.25–7. COPPICK, S., and JAHN, E. C. **The production of a structural board by gelatinization of wood wastes.** *Paper Tr. J.* 117 (3), 1943 (23–5). [New York State College of Forestry, Syracuse, N.Y.] P.R.

The process described involves the prolonged beating of finely divided wood waste, such as sawdust, and the

moulding of the treated material into structural boards which have properties similar to those of vulcanized fibre. These boards are much harder than the original wood and have approximately double its strength.

33.32 : 34.6. ROWLEY, F. B., JORDAN, R. C., OLSON, R. M., and HUETTL, R. F. **Pulp, paper, and insulation mill waste analysis.** *Bull. Univ. Minnesota Engng. Exp. Sta.* No. 19, 1942. pp. 55.

The paper discusses procedures and apparatus used in determining manufacturing losses, and the results obtained in studies at the International Falls plant of the Minnesota and Ontario Paper Company.

33.32 (71.5–7) : 98.2. STEPHENSON, J. N. **Pulp and paper making in the Maritimes.** *Pulp Paper Mag. Can.* 44, 1943 (681, 683–5, 687, 689–90).

A brief account is given of the history of the pulp and paper industry in Nova Scotia and New Brunswick.

33.36. Preservation of Wood. Seasoning and Drying

33.36.1. *Preservation against Attack by Plants and Animals*

33.36.1 : 12.26–8 : 31.43 : 13.2. WOLCOTT, G. N. **How to make wood unpalatable to the West Indian dry-wood termite, *Cryptotermes brevis* Walker. I. With inorganic compounds.** *Carib. For.* 4, 1943 (145–57). [E.e.span.]

The wood of *Bursera simaruba* is very susceptible to termite damage; when dipped for ten minutes in a solution of approximately one-half ounce of either copper sulphate, zinc chloride, barium chloride, or cadmium nitrate per gallon of water, this wood became more resistant to attack than that of *Swietenia mahagoni*, which is highly resistant in the untreated state.

33.36.1 : 31.43 : 12.25 : 13.2. NEW ZEALAND. **Annual report of the Director of Forestry for the year ended 31st March, 1943.** Govt. Printer, Wellington. 1943. pp.24.

An indigenous bark beetle (*Pachyotes ventralis*) is reported to attack freshly felled poles of Larch and Douglas Fir, and freshly sawn timber. Effective control was obtained by spraying timber with Diesel oil and creosote during the months of greatest beetle activity (p. 7).

33.36.1 : 33.31 : 01.4. HUBERT, E. E. **The curl test: method for rapidly determining water repellancy of preservatives in wood.** *Timberman* 44 (10), 1942–43 (42, 44).

A new rapid method of testing the approximate water repellancy of toxic and non-toxic water-repellant preservatives is described briefly. Strips of Ponderosa Pine sapwood, 8 in. long and $\frac{1}{4}$ in. × $1\frac{1}{2}$ in. in section, treated and untreated, are used. One end of the strip of wood is firmly clamped in the instrument provided for the test, the other end being left free. The wood is then submerged for one-half its thickness ($\frac{1}{8}$ in.) in water at 70° F., and a measure of the curl which is produced in a given time period is recorded. In order to obtain consistent results the test material should be as uniform as possible.

33.36.1 : 33.31. RITTER, L. (to Albi Chemical Corp.). **Impregnating compositions for preserving fibrous vegetable materials such as jute bags, wood or plants from microörganisms, fungi or insects.** *U.S. Patent* No. 2,310,257, Feb. 9, 1943. Chem. Abstr. 37 (4260). P.R.

An aqueous solution is used containing at least one of the compounds Cu fluoride, arsenite and arsenate, together with NH_3 and a hydroxy amine, such as triethanolamine, of low volatility and having a marked stabilizing effect on Cu–NH_3 compounds in dilute aqueous solutions and improving the impregnating and wetting properties of the solutions, and a mordant mixture of phthalic acid and naphthol compounds such as phenolphthalein and β-naphthol.

33.36.1 : 33.31. WURTH, K. **Painting organic building materials.** *Bauingenieur* 23, 1942 (144–5). Build. Sci. Abstr. 15 (*n.s.*), 1943 (514). P.R.

The fact that under present conditions it is frequently necessary to use wood that is insufficiently seasoned or of inferior quality makes the painting and preservative treatment of wood especially important. Taking into account the present restrictions respecting painting, e.g. the use of oil paints, the author sets out concisely the most suitable method of treating indoor and outdoor woodwork, the paint and impregnating materials available, their application, and the causes of paint problems.

33.36.1 : 33.31. YOUNG, A. E., and FREEMAN, R. D. (to The Dow Chemical Co.). **Compositions suitable for coating paper, wood or textile materials, etc.** *U.S. Patent* No. 2,308,664, Jan. 19, 1943. Chem. Abstr. 37 (3942). P.R.

An emulsion is formed of 1–15 parts of a wax such as paraffin in an aqueous ammoniacal solution of 1 part by weight of Al cellulose glycolate.

33.36.1 : 33.53–4. **Preservation of timber.** *Ill. Carp. Build.* 132, 1943 (1048). P.R.

The use of the oxy-acetylene flame in the preservation of timber results in:—(*a*) an accurate diagnosis of the condition of poles *in situ*; (*b*) the removal of decayed wood and the sterilization by heat of the relatively sound timber; and (*c*) preservation by the creation of a charred porous layer around the pole capable of absorbing and retaining a preservative agent such as creosote.

33.36.1 : 33.53–4. CONGER, E. F. **Preserving wooden poles or posts to be partly buried in the ground, such as telephone and telegraph poles.** *U.S. Patent* 2,308,491, Jan. 19, 1943. Chem. Abstr. 37 (3904). P.R.

A method is employed which involves impregnating the pole or post with an aqueous solution, including a preservative reagent such as $Zn(AsO_2)_2$ held in solution by a volatile acid material such as HOAc, and adapted, upon release of the volatile acid material, to result in fixation of a difficultly soluble preservative compound in and on the fibres, and immersing that portion only of pole or post which is to be buried in the ground, while still moist with the aforesaid solution, into an open body of oil heated to a temperature substantially above the boiling point of the solution for a sufficient time to effect superficial penetration of the oil and accelerate local fixation of the preservative compound in the fibres, and cooling the oil while the pole is immersed in it.

33.36.1 : 33.54. MUNTZ, H. H. **The preservative treatment of fence posts for southern farms.** *Sth. Lumberm.* 167 (2097), 1943 (65–6, 68). [Southern Forest Exp. Sta.]

The following hot- and cold-bath schedules are recommended for the preservation treatment with creosote of

thoroughly seasoned fence posts of various hardwood species from the southern United States:—

Species	*Hot bath*	*Cold bath*
	min.	*min.*
Ash	90	40
Bald Cypress (sapwood)	90	15
Elm—		
White or Soft	90	15
Rock	90	20
Hackberry	75	15
Honey Locust	90	15
Maple	90	20
Oak	90	15
Pecan	105	60
Persimmon	105	50
Sweet Gum	90	15
Willow	75	20

33.36.1 : 33.6 : 33.15. **Interim note on inner coatings for plywood containers.** *Indian For. Leafl.* (*Utilisation*) No. 49, 1943. pp. 10. [Forest Research Institute, Dehra Dun.]

Notes are given on the composition, method of preparation and application of various linings that have been tested for use in plywood containers. Data on the chemical characteristics of the linings, and the material requirements and cost of the treatment are tabulated.

33.36.3. *Seasoning. Drying*

33.36.3. **Eliminating steam losses in kiln drying.** *W. Cst. Lumberm.* 70 (7), 1943 (68).

Suggestions are made for reducing steam losses due to (*a*) leaky and poorly insulated doors, (*b*) improper ventilation, (*c*) loss of flash steam from condensate.

33.36.3 : 07.7. REHMAN, M. A. **Air condenser kiln suitable for the seasoning of cooperage woods and packing case timbers.** *Indian For. Leafl.* (*Utilisation*) No. 43, 1943. pp. 6 + dgms. [Forest Research Institute, Dehra Dun.]

A description and detailed drawing are given of a natural-draft furnace-heated kiln designed primarily for the seasoning of cooperage woods and packing-case timbers. The kiln holds about 300 cu. ft. of sawn material. The time required to dry the timber properly from the green condition is estimated at about eight days (12 hours each) for ¾-in. planks of cooperage woods such as Teak and *Cedrela toona*, and 4–5 days for ½-in. planks of packing-case woods such as *Bombax malabaricum* and *Tetrameles nudiflora*.

33.36.3 : 33.15 : 01.4. SHOVE, A. G. **Modern heating methods.** *Wood* 8, 1943 (198–201).

In this review of the recent literature on the drying of timber and the curing of resin glues by the use of a high-frequency electric circuit, the author discusses briefly the process involved and the type of apparatus required, lists the advantages and disadvantages of the method as regards both glue laminating and timber drying, and gives a brief account of specific results that have been obtained and of the development of the process since its invention.

33.36.3 : 33.51 : 31.27 : 12.25–8. GREAT BRITAIN. **Ministry of Fuel and Power. Twenty-first annual report of the Safety in Mines Research Board, 1942.** H.M. Stationery Office, London. 1943. pp. 23.

Recent tests in the seasoning of hardwood pitprops indicate that velocity of air is not an important factor as long as the air is not stagnant. It was found that the strength of softwood timbers increased by 20 and 50 per cent., respectively, when seasoned underground in air at 77° F., 47 per cent. saturated, and at 85·5° F., 64 per cent. saturated (p. 13).

Peeled hardwood props seasoned underground for seven weeks in air at 74° F., 70 per cent. saturated, were 24 per cent. stronger than similar props seasoned for the same period on the surface during August and September. Unpeeled hardwood props seasoned underground were 21 per cent. stronger than unpeeled props seasoned on the surface, but peeled props surface-seasoned were about equal to unpeeled props seasoned underground (pp. 13–4).

The following conditions are suitable for rapid seasoning underground:—a dry situation, dry bulb temperature of 75°–85° F., a difference between wet and dry bulb readings of not less than 5° F., and an air velocity of not less than 20 ft. per minute (p. 14).

33.37. Distillation. Manufacture of Tar

33.37–8. Modern tjärbränning. Några data och siffror från en mindre retortugnsanläggning. **[Modern tar distillation. Some data and figures from a small retort kiln.]** *Skogen* 29, 1942 (245–7). [Sw.]

The capacity of the retort is 8 cu. m. of wood stacked measure and the charcoal-burning period, using unbarked wood, is about 24 hours. It is estimated that the time can be reduced to 18 hours by using dry stumps. An illustrated description is given of the construction of the kiln.

The yield per stacked meter, which varies considerably with the quality of the stump wood, is on the average 60 kg. of tar (30 per cent.), tar oil (45 per cent.) and crude turpentine (25 per cent.). The charcoal yield is about 25 hl. of bagged charcoal per retort.

R. P. J.

33.38. Charcoal Manufacture. Use of Wood and Charcoal in Producer-Gas Generators

33.38.1. Kolning av rå ved i ugn. **[Charcoal-burning of unbarked wood in kilns.]** *Skogen* 28, 1941 (206). [Sw.]

Satisfactory results have been obtained in manufacturing charcoal from unbarked wood, using the 'Kvelm' kiln. A large number of these kilns are now in use in different parts of Sweden.

33.38.1 ELMER, L. A. **The Kikuyu method of burning charcoal.** *E. Afr. agric. J.* 9, 1943 (14–6).

A description of the method employed by the natives of the Kiambu Reserve in the manufacture of charcoal. The material used is half-dry Wattle or other poles varying from 1½ to 8 in. in diameter and 4 to 9 ft. in length. Details are given of the building and firing of the stack. A stack 25 ft. long, 10 ft. wide, and 3 ft. 6 in. high should produce 50 heaped sacks of charcoal from about 300 poles with 4 to 5 in. at the butt. Gangs of 4 or 5 experienced men can construct and burn a dozen such stacks in the course of a month.

33.38.1 : 07.7. IYER, J. S. **A new type of charcoal kiln.** *Indian For.* 69, 1943 (283).

A description of a simple type of kiln built by coolies from Vilbikari, a village in South Travancore. A fairly high percentage of good quality charcoal can be obtained by a process of carbonization lasting only 48

hours. The same pit can be used repeatedly; the kiln is cheap and simple in construction; no water is necessary, and no expert labour is required.

33.38.2 (485). Träkolshandelns reglering. **[Regulation of the charcoal trade.]** *Skogen* 29, 1942 (229–30). [Sw.]

According to the latest available figures there are in Sweden 67,000 producer-gas-driven motor vehicles, the majority of which are used for purely utility traffic. The consumption of producer-gas fuel is just over 4 million hl. per month, which corresponds to approximately two-thirds of Sweden's previous import of benzine.

Owing to the large increase in the number of buyers of crude charcoal and to the scarcity of material, an unhealthy competition has arisen resulting in a considerable increase in prices. According to a Government regulation of 18 July, 1942, permission to buy or sell crude charcoal has to be obtained through the Fuel Commission. R. P. J.

33.38.2. DERINGER, H. **Evaluation of wood charcoal for use in automobiles.** *Monatsbull. Schweiz. Ver. Gas- u. Wasserfachm.* 23, 1943 (2–8). [G.] *Chem. Zbl.* I, 1943 (1737). Fuel Res. Summ. 1943 (334). P.R.

The suitability of solid fuels for gasification and especially for gasification in mobile producers cannot be assessed from the grading, chemical properties, moisture, ash, and volatile contents, and thermal properties alone. A knowledge of the reactivity is essential. A laboratory method of determining the reactivity from the specific combustion is developed. Three qualities of wood charcoal are recognized, the reactivities of which are more than 80 per cent., 75–80 per cent., and 70–75 per cent. respectively of that of a standard charcoal. It is shown by road tests that the up-hill speed is proportional to the specific combustion determined by the laboratory method. Clinker formation can be estimated from the laboratory tests. The charcoal must not contain more than traces of tar.

33.38.2 : 07.7. BAINBRIDGE, J. R. **The road performance of motor vehicles operated on charcoal producer gas.** *Mod. Engr.* 16, 1942 (101–8). L.S.

It is pointed out that the principal results of the reduction in power output of the engine of a road motor vehicle when converted from petrol to producer gas is likely to be decreased speed up grades rather than inability to climb them. Methods are suggested for estimating the tractive force required to move a given vehicle and also the tractive force which a given engine and transmission system can exert. By these methods, the road performance of a number of vehicles is predicted and the results compared with road tests. One of many factors affecting the satisfactory performance of a gas producer is the maximum gas rate drawn from it. Some of the factors affecting the demand of a vehicle on the gas producer are discussed. *Author's summary.*

33.39. Manufacture of Sugar, Oils, Alcohol, and Vinegar from Wood

33.39. ZACHYSTAL, Z. **Utilization of wood sugar.** *Chem. Listy* 36, 1942 (9–10). *Chem. Zbl.* I, 1942 (3154). Chem. Abstr. 37 (3935). P.R.

A review on the preparation of wood sugar and its utilization as a carbohydrate feed, as raw material for the manufacture of alcohol, as protein feed after fermentation, and for the production of pure glucose.

33.5. *Pitprops. Sleepers. Poles and Other Roughly Converted Wood*

33.51 : 12.26–8 : 31.27. GREAT BRITAIN. **Ministry of Fuel and Power. Twenty-first annual report of the Safety in Mines Research Board, 1942.** H.M. Stationery Office, London. 1943. pp. 23.

Oak pitprops quartered by cleaving are considered to be unsatisfactory as tests have shown them to have a relatively wide range in strength values; in addition there is risk of injury from long splinters.

33.6. *Packing Boxes, Crates, etc.*

33.6 : 12.29. MOHAMMED, S. **Bamboo pill or ointment boxes.** *Indian For. Leafl.* (*Utilisation*) No. 39, 1943. pp. 6 + plate. [Forest Research Institute, Dehra Dun.]

Details are given of the manufacture of small pill or ointment boxes from bamboo. Information is included on suitable coatings and linings for this type of box.

33.7. *Firewood* (*Converted*)

33.7 : 12.26–8 (67.6) : 31.23 : 33.36.3. **Weights of woodfuel.** *Bull. For. Dep. Kenya* No. 37, 1943. p. [1].

The volume of air-dry wood fuel has been measured as 75 cu. ft. per ton of Gum (*Eucalyptus* spp.) and 67 cu. ft. per ton of mixed hardwoods. Data are given on the rate of air drying of wood fuel of *Eucalyptus globulus* and *E. saligna.*

33.8. *Other Manufactured Products*

33.8 : 12.29. LIMAYE, V. D. **Bamboo nails, their manufacture and holding power.** *Indian For. Rec.* (*n.s.*) *Utilisation* 3 (3), 1943. pp. 12 + plates.

It has been found that glued bamboo nails have a greater holding power than plain iron nails under a steady pull, when used in softwoods such as Semul (*Bombax malabaricum*). However, their holding power diminishes when they are subjected to shock and it is necessary to use a small percentage (about 25 per cent.) of iron nails in packing-case construction. The process of manufacturing bamboo nails is described.

33.8 (67.6) : 12.26–8. KENYA. **Forest Department annual report for the year 1942.** Forest Department, Nairobi. 1943. pp. 4 + appendices.

The best local wood for tool handles in Kenya appears to be Munderendu (*Teclea* spp.) though it is of scattered occurrence and rarely in large sizes (p. 3).

33.9. *Grading and Storage of Converted Timber*

33.91 (94) : 33.4. AUSTRALIA. **Australian standard grading rules (emergency series) for sawn and hewn structural timbers.** Standards Association of Australia, *Emergency standard* No. (E) 0·54, 1942. pp. 10.

33.91 (94) : 33.4. AUSTRALIA. **Grading of structural timber for designed timber buildings. Simplified version of A.S. No. (E) 0·54— Grading rules for sawn and hewn structural timbers.** Council of Scientific and Industrial Research. [1942?] pp. 2.

33.91 : 33.13. **Grade rules and specifications adopted May 14, 1915. Revised, to February, 1942 by the Slack Cooperage Group of the Associated Cooperage Industries of America, Inc.** Office of Secretary, 408 Olive St., St. Louis, Mo. 1942. pp. 21. P.R.

Specifications are given for staves, heading and hoops to be used in slack cooperage, and rules are given for inspection service.

33.91 : 33.13. **Grade rules and specifications covering tight barrel staves and heading adopted December 5, 1916. Revised to May 13, 1942, by the Tight Stave and Heading Sub-division and Tight Barrel and Keg Sub-division of the Associated Cooperage Industries of America, Inc.** Office of Secretary, 408 Olive St., St. Louis, Mo. 1942. pp. 34. P.R.

33.91 : 33.53 : 12.25. **American standard specifications and dimensions for Northern White Cedar poles.** American Standards Association, 29 West Thirty-Ninth St., New York, N.Y. 1941. pp. 9.

33.91 : 33.53 : 12.25. **American standard specifications and dimensions for Western Red Cedar poles.** American Standards Association, 29 West Thirty-Ninth St., New York, N.Y. 1941. pp. 9.

33.91 : 33.53 : 12.26–8. **American standard specifications and dimensions for Chestnut poles.** American Standards Association, 29 West Thirty-Ninth Street, New York, N.Y. 1941. pp. 10.

33.91 : 33.53 : 12.25. **American standard specifications and dimensions for Southern Pine poles.** American Standards Association, 29 West Thirty-Ninth Street, New York, N.Y. 1941. pp. 10.

33.91 : 33.53 : 12.25. **American standard specifications and dimensions for Lodgepole Pine poles.** American Standards Association, 29 West Thirty-Ninth Street, New York, N.Y. 1941. pp. 10.

33.91 : 33.53 : 12.25. **American standard specifications and dimensions for Douglas Fir poles.** American Standards Association, 29 West Thirty-Ninth Street, New York, N.Y. 1941. pp. 10.

The specifications for poles of Northern White Cedar (*Thuja occidentalis*), Western Red Cedar (*T. plicata*), Chestnut (*Castanea dentata*), Southern Pine (*Pinus palustris, P. echinata, P. taeda, P. caribaea* and *P. rigida serotina*), Lodgepole Pine (*Pinus contorta*), and Douglas Fir (*Pseudotsuga taxifolia*) cover material requirements, including prohibited, permitted and limited defects; dimensions; manufacturing requirements; storage and handling; and definitions of terms. Each specification includes a drawing illustrating measurements of sweep and short crook in poles. The standard dimensions are tabulated.

34. MINOR FOREST PRODUCTS AND THEIR UTILIZATION

34.2. *Vegetable Products*

34.21. Fodder Grass and Grazing

34.21 (47.1) : 45.11 : 97.3. LAMPIMÄKI, T. **Cattle grazing in the forest.** *Silva fenn.* 50, 1939 (1–106). [Finn.g.] S.P.S.

Extensive cattle grazing still goes on in the forests of Finland. This practice may cause little damage in fully-stocked stands where there is no young growth, and in fact may be favourable to reproduction in breaking up the moss cover and keeping down tall herbs and grasses. Continuous grazing, however, not only prevents the establishment of reproduction, but also results in damage to the trees themselves. It is estimated that for Finland as a whole the damage caused by forest grazing more than balances the value of grazing in yield of cattle.

34.24. Tanning Materials. Cork

34.24 : 12.26–8. STATHER, F., HERFELD, H., and GOTTLIEB, O. **Characteristics of vegetable tanning materials. XX. The tanning-technological behaviour of mixtures of Oak bark extracts and substitution synthetic tannins.** *Collegium* 1941 (297–318). *Chem. Zbl.* I, 1942 (3279–80). Chem. Abstr. 37 (3965–7). P.R.

34.24 (68) : 12.14.8 : 12.26–8 : 98.3. **South African Wattle bark and Wattle extract with special reference to the American market.** *Shoe Lea. Rep.* 227 (12), 1942. *Abstr.* in *J. Amer. Leather Chem. Ass.* 38, 1943 (255–7). L.S.

As a result of investigations carried out in 1936 on the marketing and export of South African Wattle bark, compulsory grading was instituted under the Forest Act of 1937, thus ensuring that the overseas buyer should receive bark or extract of standard quality. The tannin content of the bark of Black Wattle (*Acacia mollissima*), which is the only species of Wattle now grown in South Africa for bark production, is 34–39 per cent.; the moisture content of the bark is approximately 12·5 per cent., and the average content of soluble non-tannins is 10·5–11·5 per cent. The solid extract can be stored for long periods without noticeable deterioration, and is guaranteed to contain at least 60 per cent. tannin. The qualities of Wattle as a tanning material are discussed, and factors that should promote the increased importation by the United States of South African Wattle bark and extract are reviewed. The wood of Wattle is used locally for mining timber, firewood and charcoal.

34.24 (7 : 8) : 12.26–8 : 21 : 12.19. MURRAY, M. A., and MUNNS, E. N. **Possibilities of Cork Oak in the Americas.** *Chron. bot.* 7, 1943 (323–7). [U.S. Forest Service, Washington.] O.B.D.

Climatic data for over 2,000 positions in North, Central and South America were studied in order to find areas in the New World likely to be suitable for the introduction of the Cork Oak, *Quercus suber*. In the United States approximately 800 positions in California, Nevada, Arizona, New Mexico, and the Southern States were investigated.

In its native habitat in the western Mediterranean region the Cork Oak does best on deep, gravelly soils or fairly deep sandy soils of granitic origin, but it also thrives on sandy loams, and on most gravelly or rocky soils of moderate acidity. As a rule the species avoids heavy clay, poorly drained sites, and soils which are calcareous or alkaline. The best bark is generally produced by the fairly slow-growing trees which are to be found on the poorer sites.

In this paper a survey is made of areas in North, South, and Central America whose climatic conditions sufficiently resemble those of the native habitat of the Cork Oak to warrant trial plantings of this species for cork production.

34.24 (75.9) : 12.26–8. RUSSELL, A. and Associates. **Natural tanning materials of the southeastern United States. III. New tropical and subtropical sources.** *J. Amer. Leather Chem. Ass.* 38, 1943 (144–8). L.S.

Forty-five of the more common tropical and subtropical tree species in the southeastern United States were examined for tannin content. Of these, 13 contained no tannin, 9 had tannin in the bark only, and 23 had tannin in both the bark and the wood. Of the tannin-containing trees, 26 contained 4 per cent. or more in the bark, and 12 had similar practicable amounts of tannin in the wood.

Taking into account the important factors of avail-

ability, relative abundance, probable ease of propagation, rate of growth, tan content, ease of extract preparation, and resulting leather quality and colour, the 14 most promising species were:—

Conocarpus erectus (wood and bark)
Coccolobis uvifera (wood and bark)
Reynosia septentrionalis (wood and bark)
Eugenia confusa (wood and bark)
E. axillaris (wood and bark)
E. rhombea (wood and bark)
Laguncularia racemosa (wood and bark)
Rhizophora mangle (bark)
Coccolobis laurifolia (bark)
Salix longipes (bark)
Lysiloma bahamensis (bark)
Casuarina equisetifolia (bark)
Albizzia lebbek (bark)
Acacia auricularis (bark)

The results of the tests with all 45 species are given in tabulated form.

34.24 (75) : 12.26–8. Russell, A. with Associates. **Natural tanning materials of the southeastern United States. IV. The trees of the coastal plain.** *J. Amer. Leather Chem. Ass.* 38, 1943 (235–8). L.S.

Of the 39 species of trees examined from the coastal plain area of the south-eastern United States, 10 contained no tannin, 18 had tannin in the bark only, while 11 had tannin in both wood and bark. Of the tannin-bearing trees, 21 contained 4 per cent. or more of tannin in the bark or wood, or in both. The most promising species were:—

Castanea ashei (wood and bark)
Quercus virginiana (wood and bark)
Gordonia lasianthus (bark)
Ilex vomitoria (bark)
Myrica cerifera (bark)
Pinus palustris (bark)
Quercus prinus (wood and bark)
Quercus virginiana var. *geminata* (bark)
Sassafras varifolium (bark)

Special attention is drawn to *Castanea ashei* which has a high tannin content (12 per cent.) in both wood and bark.

The results of the tests with all the 39 species are tabulated.

34.24 (75.9) : 12.25–9. May, W. D., and Frahm, E. E. **Immediate sources of vegetable tannins in Florida.** *J. Amer. Lea. Chem. Ass.* 38, 1943 (210–5). L.S.

Analyses were made of the tannin content of the following plants:—

Saw Palmetto (*Serenoa repens*) which appears to be a possible source of tannin, although extraction presents some difficulties.

Cabbage Palmetto (*Sabal palmetto*): attempts to prepare a concentrated extract from the vat liquors of fibre plants of this species were unsuccessful.

Red Mangrove (*Rhizophora mangle*) is a valuable source of tannin but its inaccessibility makes exploitation difficult.

Black Mangrove (*Avicennia nitida*).

Dwarf Sumac (*Rhus copallinum*) which is not available in large quantities.

Slash Pine (*Pinus caribaea*): the bark which is now discarded at paper pulp mills might yield a useful amount of tannin of 65·5-per-cent. purity.

Turkey Oak (*Quercus laevis*), Bluejack Oak (*Q. cinerea*), Blackjack Oak (*Q. marilandica*), Southern Red Oak (*Q. rubra*), Dwarf Post Oak (*Q. margaretta*), and Sand Live Oak (*Q. virginiana* var. *geminata*); of all the species investigated, the Scrub Oaks seem to offer most promise as an economic source of tannin in Florida. The bark of Turkey, Blackjack and Bluejack Oaks gave on analysis 10·1–12·6 per cent. tannin of 67·8–69·6 per cent. purity.

34.24 (91) : 12.26–8. Kerr, G. A. **Mangroves of the East Indies.** *Shoe Lea. Rep.* 288 (8), 1942. *Abstr.* in *J. Amer. Leather Chem. Ass.* 38, 1943 (257–8). L.S.

The commercially important swamp tree species of the East Indies are *Rhizophora conjugata, R. mucronata, Bruguiera conjugata, B. sexangula, B. cylindrica, B. parviflora, Ceriops tagal, C. roxburghiana,* and *Sonneratia caseolaris.* Of these, the two species of *Rhizophora* are superior to the other tanbark-bearing trees (*Bruguiera* and *Ceriops*) in the quantity and yield of their bark. As a result of an extensive survey of the Mangroves of the East Indian islands the author concludes that mature, uniform stands of *Rhizophora* may be expected to yield 5 tons of green undecorticated bark per acre.

34.24 : 12.25. Cooke, G. B. **Comments on Douglas Fir bark cork.** *Timberman* 44 (9), 1942–43 (78). [Crown Cork & Seal Co., Baltimore, Md.]

While progress has been made in the processing of Douglas Fir bark, there are a number of points on which further research and improvement are required. These include:—(1) the objectionable taste-impairing characteristic of Douglas-Fir bark cork, (2) the inherent weakness of the cork as compared with imported cork, (3) low recovery of Douglas-Fir composition cork after compression. [Cf. *For. Abstr.* 5 (51).]

34.25. Medicinal Plants. Edible Plants

34.25 : 12.26–8. Barton, L. H. C. **Green walnuts as a source of vitamin C.** *Food Manuf.* 18, 1943 (254–6). L.S.

Green walnuts, particularly of the species *Juglans regia,* are exceptionally rich in vitamin C. The maximum vitamin content is reached about the end of July, after which the vitamin potency falls markedly with the hardening of the fruit. Experiments in the preservation of green walnuts showed that both brine and vinegar are unsatisfactory as much of the vitamin is leached out by these preservatives. Best results were obtained when fresh green nuts were preserved in syrup and sulphite solution (1,000 p.p.m. SO_2).

34.25 : 12.26–8. Melville, R., Wokes, F., and Organ, G. J. **Apparent vitamin C in walnuts.** *Nature, Lond.* 152, 1943 (447–8). [Royal Botanic Gardens, Kew.]

While the findings of the writers are in general agreement with those of previous workers in showing that walnuts are a remarkably rich source of vitamin C, recent investigations indicate that walnuts also contain considerable amounts of other substances which are estimated as ascorbic acid under the usual titration conditions but are not true vitamin C. These substances will have to be considered if accurate estimations are to be made of the vitamin C content of the fruit.

34.25 : 12.26–8. Lugg, J. W. H., and Weller, R. A. **Vitamin C in walnuts.** *Nature, Lond.* 152, 1943 (448). [Division of Animal Health and Nutrition, C.S.I.R., University, Adelaide.]

Estimations of the ascorbic acid and 'total' ascorbic

acid (including dehydroascorbic acid) content of two varieties of ripe edible walnuts (*Juglans regia*) showed that only small amounts of dehydroascorbic acid were present in the extracts.

34.25 : 12.11.11 : 12.26–8. GHOSE, T. P., and KRISHNA, S. **Ephedra concentrate and the extraction of ephedrine.** *Indian For. Leafl.* (*Chemistry & Minor Forest Products*) No. 48, 1943. pp. 6. [Forest Research Institute, Dehra Dun.]

A simple process of extraction and isolation of ephedra alkaloids from the herb (*Ephedra* spp.) is described.

34.25 : 12.14.7 : 12.26–8. TEMPERTON, H. **Feeding horse chestnuts and elderberries to poultry.** *Nature, Lond.* 152, 1943 (345–6). [National Institute of Poultry Husbandry, Newport, Shropshire.]

Although the chemical composition of horse chestnuts suggests their use as a feed for poultry, the dry matter being similar to barley, experiments in feeding cross-bred pullets with four forms of air-dried ground chestnuts [(1) raw, (2) boiled, (3) steeped for 48 hr. prior to cooking, and (4) leached in warm water for 48 hr. after cooking] were disappointing as all four rations proved markedly unpalatable to the birds.

No substantial quantity of concentrate feed is likely to be conserved by the use of elderberries in a fresh condition owing to their high water content, and it is doubtful whether drying the fruits is worth while in view of the excessive shrinkage.

34.25 : 12.14.7 : 12.26–8. WILKINS, E. G. **Mango kernels as food.** *Indian For.* 69, 1943 (338–40). *Extr.* from *Indian Fmg.* 3 (12), 1942.

A flour obtained from Mango kernels is used as a food by the inhabitants of the Kond Hills, Ganjam Agency. A chemical analysis of the flour showed that the protein content (5·56 per cent.) is lower than that of cereals, except certain varieties of rice, and is very much lower than that of pulses and nuts. The content of calcium and phosphorus (0·09 and 0·02 per cent., respectively) is also low. Nevertheless, during times of food shortage, Mango kernels could form a useful supplement to a restricted diet.

34.26. Resin. Gums. Turpentine. Oils. Rubber. Latex. Dyestuffs

34.26 (54) : 12.26–8. **Gum karaya.** *Indian Text. J.* 53, 1943 (236). L.S.

Gum karaya (or karai) [from the tree, *Sterculia urens*] is available in large quantities from the forests of Gujarat, Central Provinces, Central India, Rajputana, Marwar, Mewar, Sind, Punjab, United Provinces, and elsewhere. Recent bulk experiments have shown that gums of this type can be used to replace starch to the extent of 50 per cent. for the sizing of cotton yarn.

34.26 : 12.11.11 : 12.14.7 : 12.26–8. KRISHNA, S., and GHOSE, T. P. **Tamarind seed: a new sizing material for cotton yarn.** *Indian Text. J.* 53, 1943 (236–8). [Forest Research Institute, Dehra Dun.] L.S.

Owing to the present shortage of foodstuffs in India, due to war-time conditions, it has been necessary to impose restrictions on the use of starch as a sizing material in the textile industry. A 50-per-cent. mixture of starch and gum karaya [cf. preceding abstract] was reported to be a satisfactory substitute for pure starch, but could not entirely solve the problem. As a result of investigations on indigenous sizing materials other than foodstuffs, it was found that Tamarind seed, a very rich source of pectin, was equal to starch as a sizing material and was in some respects superior to gum karaya. This seed was formerly regarded as a waste product, and its introduction into the textile industry would be of great importance economically. The de-husked kernel of the Tamarind seed is made up of the following constituents:—

	Per cent.
Moisture	10·2
Albuminoids	15·4
Fats	6·4
Crude fibre	5·0
Sugars	2·9
Tannins	1·6
Pectins (alcohol precipitation)	58·5
Ash	2·5

The preparation of the seed and its use in sizing mixtures are described.

34.26 : 12.25 : 12.11.3 : 12.11.22 : 44.3. CURRY, J. R. **Selection, propagation, and breeding of high-yielding Southern Pines for naval stores production.** *J. For.* 41, 1943 (686–7). [Southern Forest Exp. Sta.]

Slash Pine (*Pinus caribaea*) trees giving a consistently high yield of gum have been selected for study. A start has been made in crossing trees of high-yielding capacity, using the technique that has proved successful in the development of high-yielding strains of *Hevea*.

The rooting of cuttings from trees 15 years of age and older has so far been successful only after complex chemical treatments, and in most cases rooted cuttings have died as a result of fungus attack.

34.26–7 : 12.25 (485). Gran- och tallbarr ger brännolja och kraftfoder. **[Spruce and Pine needles give combustible oil and concentrated fodder.]** *Skogen* 28, 1941 (214) [Sw.]

It is estimated that, if collection and transportation are possible, 150,000 tons of oil and 1·5 million tons of protein-rich fodder could be obtained annually from Spruce and Pine needles in Sweden. The oil, which is superior in quality to that distilled from wood, can be used in the manufacture of soap.

34.26 : 12.26–8. PATEL, C. B. **A note on the oil from the fruit of *Balanites roxburghi*.** *Curr. Sci.* 12, 1943 (58). L.S.

The oil shows the following characteristics:—Refractive index at 40° C., 1·4623; saponification value, 195·20; acid value, 0·575; acetyl value, 31·75; iodine value (Wiji's method), 88·30; unsaponifiable matter, 2·92.

34.26 : 12.26–8 (67.5). **Essential oils from the Belgian Congo.** *Bull. Imp. Inst.* 41, 1943 (167–72).

A report of tests carried out by the Imperial Institute on four essential oils from the Belgian Congo—geranium oil, basil oil, the oil of *Eucalyptus citriodora*, and an oil from an unidentified source, known as No. 137. The *Eucalyptus* oil contained a characteristically high proportion of citronellal, but in the sample examined (as in most oils of *E. citriodora*) the citronellal had a low dextro-rotatory activity, making it unsuitable for the manufacture of laevo-menthol, for which Java citronella oil is employed. It would, however, be suitable for perfumery, and under present conditions would find a ready market for that purpose.

34.26 : 12.26–8 (66.9). TRISTRAM, G. R., GEE, G., TRELOAR, L. R. G., and JEFFREY, G. A. **Characteristics of wild rubbers.** *I.R.I. Trans.* 18, 1943 (253–6). [British Rubber Producers' Research Association, Welwyn Garden City, Herts.] L.S.

The rubbers examined included those of species of *Funtumia*, *Clitandra* and *Landolphia*, and Niger paste. It is concluded that they are all polyisoprene rubbers, identical in their chemical constitution, and, when purified, similar in physical characteristics to ordinary *Hevea* rubber.

34.26 : 12.26–8 (67). MARTIN, G. **Wild rubber of tropical Africa.** *India Rubb. J.* 105, 1943 (203–6, 230–2, 239–40, 264–5). L.S.

Hundreds of different species of plants indigenous to tropical and sub-tropical Africa yield appreciable quantities of moderately pure rubber. Of those species, the latex of which contain 75 per cent. or more of caoutchouc, the most important are *Funtumia elastica*, a forest tree which grows throughout the moist regions of tropical Africa, and certain vines and climbing shrubs which are found over a still wider area and are generally able to recover more readily from exploitation. The principal genera of rubber vines are *Landolphia*, *Clitandra*, and *Carpodinus*. There are at least 20 species of *Landolphia* vines, of which the most important are *L. heudelotii* and *L. owariensis* in West Africa, and *L. kirkii* and *L. ugandensis* in East Africa.

No single method of rubber collection can be applied universally, but in most cases the vines are tapped by making numerous cuts on the stem. The preparation of the rubber also varies in different cases owing to the wide differences in chemical composition of the rubber-bearing latex of the various species. The latex of *Funtumia elastica* shows remarkable stability. The fresh latex is not coagulated by acids and can be kept for a long time without the addition of preservative. Changes in the non-rubber substances, however, do occur, and the longer the latex is kept the easier it is to coagulate. Several methods of coagulation are described. The preparation of rubber from vine latices is also discussed.

Wild rubber arriving in Britain is separated into two main grades: reasonably clean rubber, and material that requires washing. The usual loss of weight in washing is between 10 and 20 per cent., but in extreme cases over 40 per cent. may be lost. The chemical properties and degree of plasticity of different rubbers are not uniform. Generally speaking, material adulterated with resinous latices tends to be plastic. The most plastic grades produce the lowest grade of African rubber, and the least plastic grades produce the best. On the whole, African rubbers are distinctly softer than *Hevea* rubber.

With regard to vulcanization, African rubbers may be divided broadly into two groups: (1) *Hevea*, *Funtumia*, Ceara (*Manihot glaziovii*), *Clitandra* and a few species of *Landolphia* (such as *L. kirkii* and *L. ugandensis*) which vulcanize normally when well prepared and require only minor adjustments to the mix in order to give good results, and (2) most species of *Landolphia* (particularly root rubbers), which require much more powerful acceleration before they are vulcanized, but which then give good results. Tests of vulcanization of various rubbers using different mixes are described. [Cf. *For. Abstr.* 5 (133).]

34.26 : 12.26–8 (54). GRIFFITH, A. L., and BUDHIRAJA, K. L. **Some common latex-bearing woody plants of India.** *Indian For.* 69, 1943 (305–10). [Forest Research Institute, Dehra Dun.]

At the instance of the War Resources Board, India, the Forest Research Institute, Dehra Dun, is making a study of woody plants indigenous to India that have possibilities for rubber production. Analytical results for 34 native species are tabulated. For purposes of comparison, figures are given for nine commercial species.

The only species worth consideration are those which contain more than 5 per cent. of rubber and are common enough to permit economic exploitation. Such qualifications are found in two species of the gutta-percha type [*Palaguium ellipticum* (*Diochopsis elliptica*) and *Madhuca* (*Bassia*) *latifolia*] and five of the rubber type [*Wrightia tinctoria*, *W. tomentosa*, *Tabernaemontana heyneana*, *Ficus glomerata*, and *Poinsettia pulcherrima*]. Their high resin content is the main difficulty in the utilization of these species for rubber production; means of deresination by mechanical, physico-chemical or biological processes are being investigated.

34.26 (54) : 33.32. PUNTAMBEKAR, S. V., and BATRA, P. C. **Indigenous vegetable dyestuffs for pulp and paper.** *Indian For. Leafl.* (*Utilization and Chemistry and Minor Forest Products*). No. 44, 1943. pp. 8 + specimens. [Forest Research Institute, Dehra Dun.]

It is believed that commercial quantities of native dyestuffs for colouring paper pulp could be obtained from the following five sources:—(1) the seed testa of *Tamarindus indica*, (2) *kamala*, an orange-red powder which exists as a glandular pubescence on the fruits of *Mallotus philippinensis*, (3) the dried astringent exudate of *Pterocarpus marsupium*, (4) the heartwood of *Acacia catechu*, and (5) the dye, santalin, obtained from the wood of *Pterocarpus santalinus*. The availability of the raw materials, methods of extraction, prices, and the processes used in colouring the paper pulp are given in each case. The seed kernel of *Tamarindus indica* is an extremely valuable source of pectin, and if the pectin industry is developed in India, large quantities of the seed testa of this species should become available as a by-product at a very low cost.

34.27. Seeds. Fruits. Leaf Fodder. Fibres and Flosses

34.27 : 12.14.5 : 12.11.11. Foder från skogen. **[Fodder from the forest.]** *Skogsägaren* 17, 1941 (161–2). [Sw].

Certain kinds of foliage have a feeding value which approximates to that of hay. The content of digestible protein, lime and phosphoric acid in well-harvested foliage is quite as high as that in hay, and most kinds of foliage surpass hay in content of fat and N-free extractives. Two kinds of foliage are distinguished:—(*a*) leaves stripped from the branches and (*b*) leafy twigs. One feed unit is equivalent to 2 kg. of (*a*) or 5–6 kg. of (*b*). Methods of harvesting and drying are described.

38. FOREST CONSTRUCTIONAL WORKS. ENGINEERING

38 : 31.2 : 12.25–8 (54). NARAYANAMURTI, D. **Wood in mechanical and chemical engineering.** *Indian For. Bull.* (*n.s.*) *Utilisation* No. 119, 1943. pp. 13 + plates + figs. [Forest Research Institute, Dehra Dun.]

The importance of wood as a material for construction in mechanical and chemical engineering is due mainly to its many favourable physical properties. Data are given on these properties for Indian timbers, based wherever possible on the author's experimental work.

38.1 : 31.0 : 32.25 : 33.9 : 33.36 : 31.4 : 98.1 : 12.25–8. BOULTON, E. H. B., and JAY, B. A. **Building timbers.** '*Newnes Building Practice*' *Series* 9, 1943. pp. v. + 111. George Newnes Ltd., Tower House, Southampton St., Strand, London, W.C.2. [Timber Development Association, Ltd.] P.R.

This book consists of five chapters and presents much useful information on the handling and treatment of timber and on the characteristics of specific woods. In chapter 1, following the definition of various terms, notes are given on the physical properties and working qualities of wood, on felling and conversion, marketing, and the grading of structural timber. Chapter 2 deals with seasoning, preservative treatments, and the storing of timber, and chapter 3 with timber diseases and defects and the remedies thereof. Chapters 4 and 5 present information on nomenclature, distribution, timber properties and characteristics, uses and supplies of individual softwood and hardwood species respectively.

38.1 : 33.15 : 31.27. **Plywood webs and solid or laminated flanges feature new built-up 'Timbeam' girders.** *B.C. Lumberm.* 27 (7), 1943 (61–2).

A brief description is given of a structural framing material in the form of girders built up of plywood webs and solid or laminated flanges. These 'Timbeam' girders are relatively light in weight and have the strength of steel or solid wood members.

38.2 : 33.15. **Prefabricated timber houses.** Timber Development Association, Ltd., 75 Cannon Street, London, E.C.4. 1943. pp. 26.

This publication discusses various systems of timber house construction and methods of prefabrication.

38.2 : 33.36 : 33.15. GRAF, O. **Economical use of wood in building.** *V.D.I.* 86, 1942 (339–45). Build. Sci. Abstr. 16 (*n.s.*), 1943 (535). P.R.

Conditions for the most advantageous use of timber supplies are indicated. An investigation of the problem has shown the following measures to be urgent:— The grading of wood for building according to the technical requirements; the determination of the permissible stresses for building wood of different qualities; the fixing of permissible deviations in dimensions, especially of beams and struts; the development of means of conserving and improving wood; the development of suitable types of joint, especially of glued joints; the examination of existing types of structural members for their suitability and of means of improvement on development. Consideration is given to the advantages in the use of building timber as indicated in the recently issued standard specification DIN 4704, which includes conditions for the use of half-dry timber. The question of the fuller utilization of seasoned wood in building is briefly considered, and the need for investigating further the moisture content and the effect of shrinkage is mentioned. Attention is drawn to the need for constant control of the strengths of wood of the three classes laid down, from the standpoint of more exact definition of their strength under different conditions and increasing the permissible stress. The need for care in the drying and storage of wood is emphasized, and reference is made to the regulations on drying of the Fachausschuss für Holzfragen. Consideration is given also to the strength of joints, especially glued joints using synthetic resin adhesive and to that of built-up timber members.

38.2 : 31.27 : 33.4 : 33.91 : 31.8. LANGLANDS, I. **Modern developments in the design of timber structures.** *J. Inst. Engin. Aust.* 14, 1942 (115–9). [Division of Forest Products, Council for Scientific and Industrial Research, Australia.] L.S.

In this paper the author discusses various sections of the *Handbook of structural timber design* [cf. *For. Abstr.* 4 (53)] and the information contained therein under the headings:—nomenclature; structural grading rules; properties of structural timbers; working stresses; design methods; beams; columns; built-up columns; bolted joints; timber connectors; and new types of construction.

38.2 : 07.7. **New groove cutting tool.** *Sth. Lumberm.* 167 (2097), 1943 (58).

An improved, power-driven cutting tool has been developed by Circo Tool Co., Milwaukee, for use in cutting the circular grooves and countersinking bearing plates in the preparation of timber for ring-connector joints.

38.8 : 11.62.31. HARRISON, J. L. **River training works.** *Indian For. Leafl.* (*Timber Development Branch*) No. 36, 1943. pp. 11 + plates. [Forest Research Institute, Dehra Dun.]

An illustrated account of engineering methods used in controlling river courses and so protecting the banks from erosion. These include various types of revetment and guide bunds.

4. FOREST INJURIES AND PROTECTION

42. INJURIES FROM INORGANIC AGENCIES, EXCLUDING FIRE

42 : 12.25–8 : 23.21 : 23.27. MILLER, P. A., and ROEWEKAMP, F. W. **Environmental factors in relation to tree decline.** *Trees, Sta. Monica, Calif.* 6 (1), 1943 (9–11). [University of California.]

An account of investigations made in 1941 into the sudden decline and death of many large roadside trees along portions of Chandler Boulevard and Sherman Way in the San Fernando valley. Notes on the drainage situation in this valley in 1921–22 revealed the widespread deleterious effects at that time of a high water table. In December 1941 a total of 217 trees was found to be killed or badly damaged; the species were *Cedrus deodara* (198), *Magnolia grandiflora* (15), *Pinus radiata* (2), *Acacia decurrens*, and *A. melanoxylon*. *Casuarina stricta* and *Sterculia diversifolia*, even when growing among trees severely injured or killed, showed no evidence of injury.

Environmental factors influencing the decline or collapse of trees in the area appear to be rainfall, topography, soil types and structure, drainage and water-table levels, and the presence of toxic materials. The decline of plants is most general in late spring,

following heavy and prolonged winter and early spring rains and the consequent rise in the water table which in places reaches to within a foot of the soil surface, and subsides slowly. Poor aeration due to the waterlogged condition of the soil is obviously an important factor in tree decline. Examination of two fallen Deodars showed that all the main and lateral roots below the 3-4 ft. level were rotten and decomposed.

Analysis of the soil water for toxic substances revealed that it was strongly saline. The concentrations of boron and nitrite were also high enough to be injurious.

42.2. *Temperature Influence*

42.21 : 12.25 : 21.0 (931). NEW ZEALAND. **Annual report of the Director of Forestry for the year ended 31st March, 1943.** Govt. Printer, Wellington. 1943. pp. 24.

A severe summer frost on the plateau of Central North Island (altitude, 2,900 ft.) destroyed experimental plantings of Douglas Fir and *Pinus radiata* and seriously damaged *P. laricio*. Little damage was caused to Larch and [*Cupressus*?] *macrocarpa*; the hardiest species at this altitude are *Pinus ponderosa* and *P. murrayana* (p. 7).

42.21 : 12.25. BORNEBUSCH, C. H., and LADEFOGED, K. Hvidgranens og Sitkagranens Dodelighed i Hede- og Klitplantager i 1938 og 1939. [**Cold damage to White Spruce and Sitka Spruce in heath and dune plantations during 1938 and 1939.**] Det Forstlige Forsøgsvaesen i Danmark, *Report* 15, 1940 (209–32). [Dan.g.] S.P.S.

During the winter of 1938–9 severe damage due to low temperature was observed on White Spruce (*Picea glauca*), Sitka Spruce (*P. sitchensis*) and Douglas Fir (*Pseudotsuga taxifolia*). This was the result of an unusually high temperature in March (6·5° to 10° C. above the normal temperature) being followed by a very low April temperature—3·8° to 9·7° C. below zero. The cambial zone had commenced activity previous to the April frost and was severely injured.

42.21 : 12.25–8. FELT, E. P. **Winter injury manifested later.** *Amer. Nurserym.* 78 (5), 1943 (12). [Bartlett Tree Research Laboratories.]

A review of damage caused to trees in the arboretum of the Bartlett Tree Laboratories, Stamford, Connecticut, by the low winter temperatures of 1942–3. Among the trees and shrubs which were killed back to the ground, or nearly so, by frost, were Chinese Orange (*Poncirus trifoliatus*), Mazzard Cherry (*Prunus avium*), Holly (*Ilex crenata microphylla*), a Japanese Maple (*Acer argutum*), Willow Oak (*Quercus dentata*), a Chinese Oak (*Q. variabilis*), Chinese Winter Hazel, two small Sequoias, *Celtis sinensis*, three small, recently transplanted Sweet Gums, Autumn Elaeagnus, and Wilson and Pratt Barberries. In the case of some trees the effects of snow protection were marked. In mid-June, for example, *Taxus* and some other species showed several inches of new growth on the lower, snow-protected branches, while buds on the exposed higher branches had scarcely started to grow.

42.21 : 12.26–8 : 44.3 : 12.21 : 23.26. YOUNG, G. Y. **Root rots in storage of deciduous nursery stock and their control.** *Phytopathology* 33, 1943 (656–65). [Mississippi Agric. Exp. Sta., State College, Miss.]

Investigations showed that rather heavy losses of seedling stock in certain nurseries in the Upper Mississippi valley were due primarily to injuries caused by freezing. Plants injured in this way tended to become invaded by numerous fungi while in storage, especially by species of *Fusarium* and *Alternaria*. There were marked differences among the various plants tested in their resistance to low temperatures. Black Locust (*Robinia pseudoacacia*), Siberian Elm (*Ulmus pumila*), Osage Orange (*Maclura pomifera*), Russian Mulberry (*Morus alba* f. *tatarica*) and Wild Plum (*Prunus americana*) appeared to be particularly susceptible to frost injury, while the Siberian Pea Tree (*Caragana arborescens*) and Green Ash (*Fraxinus pennsylvanica* var. *lanceolata*)—particularly the latter—could withstand exposures to lower temperatures and for longer periods without serious injury.

It is recommended that, as far as is practicable, deciduous nursery stock should be lifted and handled when the temperature is above freezing, and that indoor storage facilities should be such that a high relative humidity is maintained and temperature fluctuations are controlled within narrow limits above freezing (34° to 50° F.). In outdoor storage, deep heeling-in is important. Loamy soils are preferable for this purpose, and porous media should be avoided in regions where the winters are severe.

42.22 : 11.11.4 : 23.21. PRASAD, J. **Drought in relation to forestry.** *Indian For.* 69, 1943 (356–60).

A review of published information on drought in relation to forestry: the nature of drought, its effects on tree growth, and possible remedial measures. A short list is given of species susceptible, fairly resistant, decidedly resistant, and conspicuously resistant to drought. The latter include the native Indian species *Miliusa velutina*, *Stereospermum suaveolens*, *Diospyros melanoxylon*, *D. tomentosa*, *Ficus bengalensis*, and *F. religiosa*, and the exotics *Elaeagnus angustifolia*, *Quercus macrocarpa*, *Acacia decurrens*, *Robinia pseudoacacia*, *Eucalyptus globulus*, *Populus deltoides*, and *Ulmus americana*.

42.6. *Electrical and Cosmic Influences*

42.61 : 12.25 : 22.88.1 : 22.14.2. WADSWORTH, F. H. **Lightning damage in Ponderosa Pine stands of northern Arizona.** *J. For.* 41, 1943 (684–5). [Tropical Forest Exp. Sta.]

About one-third of the total timber mortality in the Ponderosa Pine forests of northern Arizona is the result of lightning which also causes considerable defect in trees that recover from strikes. Measurements were made over a period of fifteen years to determine the lightning damage in comparable virgin and cut-over stands. It is concluded that, on a percentage basis, damage from lightning was not greatly affected by cutting but was about proportional to the volume of timber in the stand. Losses in cut-over stands could be materially reduced by shortening the cutting cycle, thus permitting frequent salvage of lightning-struck but living timber.

43. FOREST FIRES

43 (75–6). **Preventing destructive fires in southern woodlands.** *Fmrs.' Bull. U.S. Dep. Agric.* No. 1926, 1943. pp. 15. [U.S. Forest Service.]

A brief discussion of the causes and effects of forest fires in the southern United States. Suggestions are made for the reduction of fire hazards, and notes are given on fire-fighting methods and organization.

43.0. *Predisposing Factors and Causes*

43.01 : 11.14.7 : 11.11. Ångström, A. Riskerna för skogsbrand och deras beroende av väder och klimat. **[The fire hazard in the forest as influenced by weather and climate.]** *Svenska SkogsvFören. Tidskr.* 40, 1942 (323–43). [Sw.e.]

The inflammability of the ground vegetation was tested by placing a ½-gm. meta tablet on the ground and setting it alight. Rate of spread was measured in relation to relative humidity of the air and the plotted data yielded ω-shaped curves. In applying a formula for computing an index of inflammability based on relative humidity and temperature, it is shown that a rise in temperature of 10° C. offsets a 20-per-cent. increase in relative humidity. The principles and organization of a fire-warning system are discussed.

43.02 : 12.19.2–3 (74 : 75.1–4). Jemison, G. M., and Keetch, J. J. **Rate of spread of fire and its resistance to control in the fuel types of eastern mountain forests. A progress report.** *Tech. Note Appal. For. Exp. Sta.* No. 52, 1942. pp. 15.

An analysis is made of fire-report data to determine the importance of 14 forest-fuel types in the eastern region of the United States (including the southern Appalachians northwards) in influencing the rate of spread of fire and its resistance to control. It is shown that 77 per cent. of all fires occur in the 'medium' rate-of-spread fuels and 66 per cent. in the 'medium' resistance-to-control fuels. The relation of rate of spread, held-line output, and area burned to fire-danger class is given.

43.3. *Fire Damage*

43.3 : 32.24–5. Kinnman, G. Erfarenheter rörande tillvaratagandet av brandskadad skog. **[Utilization of wood from forest fire areas.]** *Svenska Skogsv-Fören. Tidskr.* 40, 1942 (117–60). [Sw.e.]

Trees in which the inner bark and cambium are undamaged by fire can sometimes be retained but all other trees must be felled and utilized. In one case it was observed that although a large number of trees survived the first summer after a fire, and a few lived through the second summer, not a single tree was alive after three years. There are many forms of secondary injury due to insects and fungi besides the discoloration and charring of the wood due to the fire.

Difficult felling and transport conditions have to be reckoned with in salvage operations. Stumpage values are reduced by 15 per cent. if damage is slight and by as much as 50 per cent. if the damage is severe. Timber should be utilized as quickly as possible after forest fires that occur in the early summer; however, if the fire takes place later in the summer it is preferable to postpone the felling until after the first frost in order to avoid the risk of blue stain. Felling is best done in the winter when the soot on the ground is covered by snow.

43.3 : 56.02 : 12.25. Jemison, G. M. **Effect of single fires on the diameter growth of Shortleaf Pine in the southern Appalachians.** *J. For.* 41, 1943 (574–6). [Appalachian Forest Exp. Sta.]

Studies made in an old-field stand of Shortleaf Pine (*Pinus echinata*) and in an uneven-aged Pine/Oak mixture, burned in 1925 and 1930 respectively, indicate that single fires do not necessarily retard the growth of individual trees on the burned areas even when the foliage of such trees is severely scorched by ground fires.

44. DAMAGE BY HARMFUL PLANTS. VIRUS DISEASES

44 : 12.26–8. West Virginia. **Epistle to the farm. The report of the Director, West Virginia Agricultural Experiment Station, Morgantown, for the biennium 1940 to 1942.** *Bull. W. Va. agric. Exp. Sta.* No. 307, 1943. pp. 56.

It has been found that although the presence of Walnut trees will improve pasture conditions and will not inhibit the growth of other important forest species, their close association with apple trees, potatoes and tomatoes has a definitely adverse effect on these crops (pp. 49–50).

44.3. *Fungi*

44.3 : 12.21. Hamilton, J. M., Palmiter, D. H., and Mack, G. L. **Particle size of sulphur and copper fungicides in relation to Apple scab and Cedar-apple rust control.** *Phytopathology* 33, 1943 (533–50).

It was established by means of field, greenhouse, and laboratory experiments that the fungicidal effectiveness of ground, wettable sulphurs and an insoluble copper is inversely proportional to the size of the particles.

44.3 (74.4) : 23.27. McKenzie, M. A. **A civilian program for tree protection.** *Bull. Mass. agric. Exp. Sta.* No. 397, 1942. pp. 32.

Investigations were undertaken in all parts of Massachusetts to find out what significant defects were present in the trees of the State and what treatment could be used to lessen the risk of decay. Forest and shade trees were included in the survey, but special attention was given to street plantings. In this paper the main causes of tree decay in Massachusetts are briefly analysed, and methods of treatment are given for various disorders.

44.3 : 12.25 (78.9 : 79.1) : 12.21. Andrews, S. R., and Gill, L. S. **Western red rot of immature Ponderosa Pine in the southwest.** *J. For.* 41, 1943 (565–75). **[U.S. Bureau of Plant Industry.]**

Western red rot, which is caused by *Polyporus anceps*, is the primary heart rot of Ponderosa Pine (*Pinus ponderosa*) in the southwestern United States; it enters living trees mainly through dead branches. This paper reports on a survey made in Arizona and New Mexico to determine the severity of this disease and the control measures applicable. Analyses showed that the susceptibility of dead branches to infection increased with size and that time was the principal factor determining the severity of decay in the trunk. The percentage of trees infected in the plots studied increased directly with (1) the percentage of trees with one or more large dead branches, and (2) the percentage of trees larger than 5 in. d.b.h. It was also found that infection increased as stand density decreased. Recommendations are given for reducing ultimate rot losses in second-growth timber.

44.3 : 12.14.7 : 12.25. Geete, E. Kottesjuka. **[Cone disease.]** *Skogen* 29, 1942 (187). [Sw.]

Many cases of cone diseases have been described by Lagerborg [*SkogsvFören. Tidskr., Stockh.* 1911 (135–9)]. This abnormality is found most frequently on young trees (20–30 years old). According to Lagerborg the disease occasions a more or less pronounced reduction in subsequent development and the needles on the next generation of shoots are usually weak. A case was reported by Sylvén in which the terminal bud was

killed by the disease. An illustration of the disease shows an agglomeration of 66 Pine cones on the terminal shoot of a 25-year-old tree. R. P. J.

44.3 : 12.25 : 12.21. HAHN, G. G. **Taxonomy, distribution and pathology of *Phomopsis occulta* and *P. juniperovora*.** *Mycologia* 35 (1), 1943 (112–9). R.A.M. 22, 1943 (281–2).

In wound inoculation tests carried out during 1941 in an unheated greenhouse at the Marsh Botanical Garden, Yale University, monospore cultures of *Phomopsis occulta* failed to infect any of the 14 wildling Eastern Red Cedar (*Juniperus virginiana*) saplings inoculated, whereas inoculations with *P. juniperovora* were entirely successful in all 7 saplings used. Saplings of a bluish-green colour were girdled and killed, whereas those of a lighter and brighter green showed some resistance.

P. occulta is stated to be widely distributed on conifers both in western Europe and throughout North America, while its perfect stage, *Diaporthe conorum*, though common in Europe, is very rare in the Western Hemisphere. In the course of the author's investigations in Great Britain from 1926 to 1929, fruiting bodies of *D. conorum* were obtained experimentally on twigs of *Ulmus procera* from monopycnidiospores of the fungus originally isolated from cultures of monoascospores from Douglas Fir (*Pseudotsuga taxifolia*). *P. occulta* is considered to be a secondary invader of Cedars following some injury to the host plant, although some forms were found to be weakly parasitic on the coast form of Douglas Fir.

The pathogenic species, *P. juniperovora*, the *Diaporthe* stage of which is as yet unknown, is stated to be parasitic under natural conditions only on hosts of the Cupressaceae, a revised list of which is given. Under experimental conditions saplings of the coast form of Douglas Fir were found to be highly susceptible to this fungus, but nursery stocks of this host were never observed to be attacked. The fungus is stated to occur as a nursery parasite on hosts of the Cupressaceae family both in Europe and in the United States.

44.3 : 12.25 : 12.21. HAHN, G. G., and AYERS, T. T. **Rôle of *Dasyscypha wilkommii* and related fungi in the production of canker and die-back of Larches.** *J. For.* 41, 1943 (483–95). [Bureau of Plant Industry, U.S.D.A.]

Wound-inoculation experiments made under controlled conditions in the field and in the greenhouse demonstrated that the Larch-canker fungus [*Dasyscypha wilkommii* (Hart.) Rehm] will infect both vigorous and non-vigorous trees of Tamarack (*Larix laricina*), Western Larch (*L. heterophylla*), European Larch (*L. decidua*), Japanese Larch (*L. leptolepis*) and Dahurian Larch (*L. dahurica*). Tests showed that Larches became infected at all seasons of the year, but there is less likelihood of infection from inoculations made during the summer.

In comparable field experiments, a group of closely related but morphologically distinct large-spore, saprophytic *Dasyscyphae*, which in the past have been confused with the parasite, were tested but failed to grow upon either vigorous or non-vigorous Tamarack, European Larch, or Japanese Larch. The morphological as well as the physiological differentiation of the related fungi was of paramount importance to the formulation of methods for the control and prevention of further spread of the introduced Larch canker in the United States.

44.3 : 12.25 : 12.21. NENZELL, G. Snöskyttestudier å Bergvik och Ala Nya Aktiebolags marker II. [**Studies on *Phacidium* blight in districts belonging to Bergvik and Ala Nya Ltd.**] *Norrlands SkogsFörb. Tidskr.* 47, 1942 (64–100). [Sw.g.] S.P.S.

The author carried out experiments to determine the possibility of transmitting the disease to young Pine plants from 1- and 2-year-old needles that were infected. Results with the 2-year-old needles were negative, while symptoms of the disease from 1-year-old needles were more severe if infection took place in October–November than in December–April. The depth and consistency of the snow covering had a pronounced influence on the disease; this is illustrated by figures and diagrams.

44.3 : 12.25 : 12.21. ROLL-HANSEN, F. **An investigation of the possibility of ascertaining different races of *Polyporus annosus* connected with different hosts or localities in Norway south of the Dovrefjell.** *Medd. norske Skogforsøksv.* No. 24, 1940 (5–100). [Nor.e.] S.P.S.

Up to 1937 *P. annosus* was well known in south-eastern Norway as a rot fungus on *Picea abies*, and in western Norway it had done great damage to *Pinus sylvestris*. From field investigations the author has shown that *P. annosus* was not uncommon on *P. sylvestris* in southeastern Norway and very common on *Picea abies* in western Norway. There are no differences in regard to spores, growth rate or appearance in cultures isolated from different hosts. In infection experiments the cultures showed differences in virulence. One culture, isolated from *Pinus sylvestris*, seemed to have the power of killing plants of *P. sylvestris*, *Picea abies* and *Betula* sp. In all infection experiments only a low percentage of the plants were infected, indicating that *P. annosus* is but slightly parasitic. A number of cytological observations were also made.

44.3 (71) : 12.25–8 : 12.21. CANADA. **Twenty-second annual report of the Canadian plant disease survey, 1942.** Dominion Department of Agriculture, Science Service: Division of Botany and Plant Pathology. 1943. pp. xix + 110.

Among the more common diseases of forest and shade trees reported from Canada are the following:—tar spot (*Rhytisma acerinum*) on *Acer saccharinum*, *A. rubrum*, *A. saccharum* and *A. spicatum*; brown mould (*Gonatorrhodiella highlei*) associated with *Nectria coccinea* on *Fagus grandifolia*; needle cast (*Hypodermella laricis*) on *Larix occidentalis*; rust (*Chrysomyxa* spp.) on *Picea pungens*; leaf blight (*Linospora tetraspora*) on *Populus tacamahaca* and leaf spot (*Marssonina castagnei*) on *Populus* spp.; rust (*Melampsora albertensis*) and leaf blight (*Rhabdogloeum pseudotsugae*) on *Pseudotsuga taxifolia*; rust (*Melampsora* spp.) and powdery mildew (*Uncinula salicis*) on *Salix* spp.; leaf spot (*Septoria sambucina*) on *Sambucus racemosa*; rust (*Gymnosporangium juniperi*) on *Sorbus* spp.; leaf spot (*Cercospora microsora*) on *Tilia americana*; and coral spot (*Nectria cinnabarina*) on *Ulmus pumila*. A few White Pines in Prince Edward Island were affected by the rust, *Cronartium ribicola*. An appreciable reduction of currant rust has been observed where White Pines have been removed.

44.3 : 12.26–8 : 12.21. RAYSS, T., and HABELSKA, H. ***Rhamnus palaestina* Boiss.—a new host of crown rust.** *Palestine J. Bot.* [*Jer. ser.*] 2, 1942 (250).

Inoculations of various gramineous plants with

aecidiospores of *Puccinia coronata* from a heavily infected shrub of *Rhamnus palaestina* from the Judean mountains resulted in the infection of only two of the tested plants:—*Avena barbata* and *Phalaris minor*. Although *Rhamnus palaestina* is a new host for this fungus, its rôle in the distribution of crown rust is probably not important since *Puccinia coronata* overwinters in the uredinial stage in Palestine.

In the Botanical Garden of the Hebrew University of Jerusalem another Buckthorn (*R. alaternus*) was observed also to be infected by a rust (probably the same one), but the infection was in the pycnidial stage, and no aecidia have yet been found.

44.3 : 12.26–8. WENZL, H. Untersuchungen über die Kräusel- (Sternflecken-) Krankeit von *Prunus armeniaca* und anderen Prunaceen. **[Investigations on the curled leaf (leaf spot) disease of *Prunus armeniaca* and other Prunaceae.]** *Phytopath. Z.* 13 (6), 1941 (588–623). Biol. Abstr. 17 (19207).

Extensive cultures were carried out on young trees in attempted transmission studies. The symptoms varied at different times during the season. In general the disease was found to be identical with that described by Christoff (1938) as a mosaic from Bulgaria. The studies were based upon *Prunus armeniaca* and *P. cerasifera*. The spot disease of *P. domestica* and *P. persica* is considered to belong to the same group. In many ways the disease is similar to the mosaic of *Pelargonium*. Transmission studies on young trees indicate that the disease is physiological and not caused by a virus.

44.3 : 12.26–8 : 12.21. ZENTMYER, G. A. **Vascular chemotherapy**. *Trees, Sta. Monica, Calif.* 6 (1), 1943 (7, 16–7).

A discussion of the potential value of chemotherapy in the treatment of vascular diseases in plants, with particular reference to Dutch Elm disease. The aim of investigations undertaken by several experiment stations has been to find chemicals which can be introduced directly into the vascular system of plants to control wilt fungi, or to prevent their development, without causing appreciable injury to the host. Satisfactory methods for the adequate distribution of the chemical in the plant must also be developed.

It is known that certain vitamins are necessary for the growth of fungi, as of other plants, among these being vitamin B_6 (pyridoxine) which is required for the normal development of *Ceratostomella ulmi*, the causal agent of Dutch Elm disease. According to recent theories, some drugs are effective against bacteria causing disease in man because of the structural resemblance of the molecules of these chemicals to those of certain vitamins required by the bacteria, for which they appear to be 'mistaken'. A number of chemicals similar to vitamin B_6 have been examined by Dr. W. J. Robbins of New York Botanical Gardens, and one compound which is toxic to *C. ulmi* has been discovered. However, very small amounts of the vitamin will counteract the effect of large amounts of the poisonous chemical.

If it is possible in tree injections to use chemicals which neutralize the fungous toxin, it may not be necessary to kill the pathogen itself. Certain organic chemicals can safely be introduced into Elm trees and other plants at concentrations considerably above those required, under laboratory conditions, to prevent fungous growth. The adequate distribution of these chemicals in the tree, however, is a difficult matter. The usual method of introducing aqueous solutions of chemicals into the trunk has many disadvantages, including incomplete distribution and the disruption of vascular tissues. Introduction of the chemical via the roots also incurs obvious disadvantages, such as the sensitivity of small functional roots to toxic influences and the small proportion of the chemical likely to be absorbed. The effects of spraying are being investigated.

Practical experiments have shown that chemical injections prior to inoculation with *Ceratostomella ulmi* have prevented the development of Dutch Elm disease in young Elm trees; while similar injections into small trees already infected have reduced the severity of the symptoms. Large trees are difficult to treat owing to the problem of distributing the chemical evenly throughout the tree and to the fact that the vascular system of diseased trees is in many cases blocked before treatment is begun.

Actual control of vascular diseases by chemical treatment has not been achieved, but progress so far is encouraging.

45. DAMAGE BY ANIMALS

45.1. *Mammals*

45.12 : 13.2 : 12.26–8 (485). DANNFELT, M. J. Älgarna och den sydsvenska lövskogen. **[Elk and the south Swedish broadleaved forests.]** *Skogen* 28, 1941 (217–8). [Sw.]

A problem of great importance to forest conservation in southern Sweden is the increase of elk which cause much damage to the broadleaved forests in the region. It is highly desirable that the law should be changed as soon as possible in order to exclude the elk entirely from these forests.

45.3. *Insects*

45.3 (485). TRAEGORDH, I. Nyare riktlinjer inom svensk skogsentomology. **[New lines of practice in Swedish forest entomology.]** *Ent. Medd.* 22 (1), 1940 (30–2). Biol. Abstr. 17 (19234).

A brief account is given of the work being done to combat insect pests in the forests of Sweden.

45.3 (729.5) : 13.2. MARTORELL, L. F. **Forests and forest entomology**. *Carib. For.* 4, 1943 (132–4). [E.sp.] [Agric. Exp. Sta., Rio Piedras, Puerto Rico.]

A brief discussion of various insect pests of forest trees in Puerto Rico and of the damage they cause.

45.3 : 13.2. FULMEK, L. Erforschung und Bekämpfung der San José-Schildlaus. **[Research on and control of the San José scale.]** *Mitt. Biol. Reichsanst.* No. 65, 1941 (95–6). [G.] *Abstr. in Z. PflKrankh.* 52, 1942 (556). R.A.E. A31 (373).

In Austria, outbreaks of *Aspidiotus perniciosus*, Comst., occur only in the warmer districts. The natural enemies recorded are *Chilocorus bipustulatus*, L., *Exochomus quadripustulatus* L., *Cybocephalus politus*, Gylh., *Deraeocoris ruber*, L., and *Polynema fulmeki*, Soyka.

45.3 : 13.2 : 05.3 (97). IMPERIAL AGRICULTURAL BUREAUX. **Reports on the parasite service 1904 41 to 1942/43, being supplements to the annual reports of the Executive Council for those years.** Executive Council of the Imperial Agricultural Bureaux, 2, Queen Anne's Gate Buildings, London, S.W.1. 1943. pp. 18.

In the section of this report dealing with forest

insects and their parasites (pp. 3–5) notes are given on the following species:—

1. The Pine shoot moth (*Rhyacionia buoliana*) causes considerable damage in certain areas of North America; it is increasing in numbers and the introduction of additional parasites appears advisable.

2. The South African browntail (*Euproctis terminalis*) is a serious pest of exotic Pines in South Africa. Attempts to introduce suitable parasites have been unsuccessful owing to difficulties of transport.

3. The soft brown scale (*Coccus hesperidum*) causes serious damage to Holly plantations in British Columbia. Consignments of parasites have been lost through delays in censorship.

4. The Spruce budworm (*Cacoecia fumiferana*) is probably the most important forest insect in Canada; it is particularly injurious to Balsam Fir but also attacks Spruce and Jack Pine. Investigations are being made on suitable parasites.

5. The tent caterpillar (*Malacasoma indica*), which causes serious damage in the north of India, resembles the American species in habit and an exchange of parasites might have useful results.

6. White grubs (*Melolontha* sp., etc.). An exchange of white grub parasites between Canada and Great Britain is contemplated. A survey is being made in South America for parasites that might be useful against white grubs of the genus *Odontria* in New Zealand.

45.3 : 13.2 : 12.21. SCHAERFENBERG, B. Die biologische Bekämpfung des Maikäfers und seiner Larvae mit *Beauveria densa*. **[The biological control of the cockchafer and its larva by *Beauveria densa*.]** *Anz. Schädlingsk.* 17, 1941 (53–5). *Abstr.* in *Z. PflKrankh.* 52, 1942 (563). R.A.E. A31 (376).

The author attributes the failure that has attended attempts to control the larvae of *Melolontha* by means of *Beauveria densa* to the divergent soil conditions required by the two organisms, and considers that the fungus can be of value in damp forest soils rich in humus. Laboratory experiments showed that infection succeeded more readily in damp, humus soil than in dry, sandy soil, whereas mass increases of the beetle occur chiefly in the latter type of soil.

45.3 : 13.2 : 12.21. SYLVÉN, N. *Cordyceps militaris* Fr. på *Dasychira pudibunda* (L.) **[*C. militaris* on *D. pudibunda*.]** *Bot. Not.* 1942 (97–8). *Abstr.* in *Z. PflKrankh.* 52, 1942 (546–7). R.A.E. A31 (369).

The author reviews cases in which *Cordyceps militaris* has afforded control of the larvae and pupae of injurious Lepidoptera and states that this fungus caused great mortality of the pupae of *Dasychira pudibunda*, L., during an outbreak of this lymantriid in a Beech forest in Skåne, Sweden. It has not often been recorded from Sweden, but is probably commoner there than has been thought.

45.3 : 12.25 : 13.2. CHRYSTAL, R. N. **Galls of *Adelges* (*Gillettea*) *cooleyi* Gillette (Hem., Adelgidae) on Sitka Spruce in Cumberland.** *Ent. mon. Mag.* 79, 1943 (233). [Hope Department of Entomology, Oxford University Museum.]

Galls of *Adelges cooleyi* were reported in February, 1943, to be present in large numbers in Spruce plantations at Thornthwaite, Cumberland. As far as is known by the writer, this is the first time that the gall stage of this insect has been taken in England, although galls of *A. cooleyi* had previously been observed on Sitka and White Spruce in Scotland.

45.3 : 12.25 : 13.2. DE GRYSE, J. J. **Note on *Marmara fasciella* Chambers.** *Canad. Ent.* 75, 1943 (40). R.A.E. 31A (348).

Marmara fasciella, Chamb., has been found to construct long linear mines in the phloem of the trunk and branches of *Pinus strobus* and is probably distributed over the entire range of this Pine in North America. The adults emerge between the last days of May and the first week in July and oviposit on the bark. The larva penetrates into the phloem through the underside of the egg, constructs about half of the mine during late summer and autumn and hibernates there; it resumes feeding early in spring, completes its mines in May or June, and then spins its cocoon. Apparently identical mines and larvae were found in *Abies balsamea* in Ontario and *Pinus monticola* in British Columbia, but no adults were reared from them. *M. fasciella* is heavily parasitized by species of *Copidosoma*, *Habrocytus* and *Elachertus*, *Hemiteles tenellus*, Say, and two species of *Pleurotropis*.

45.3 : 12.25 (485) : 13.2. FORSSLUND, K.-H. Nordliga öronviveln—en skadegörare på barrträdens groddplantor i Norrland. **[The northern broad-nosed weevil—a pest on conifer seedlings in northern Sweden.]** *Skogen* 28, 1941 (253–5). [Sw.] S.P.S.

From investigations of the influence of animal life on natural regeneration the author has found that a number of insects and slugs, common in the forest, readily attack young seedlings. The insects are mainly polyphagous weevils and moth larvae which usually feed on the leaves of *Vaccinium myrtillus*. *Otorrynchus dubuis* Ström, a boreo-alpine species, is very common in forests that contain bilberries. The adult weevil eats the stalks of the seedlings, and the larvae, which live in the soil, eat the roots.

45.3 : 12.25 : 13.2 : 13.14–5. FURNISS, R. L. **Biology of *Cylindrocopturus furnissi* Buchanan on Douglas-Fir.** *J. econ. Ent.* 35, 1942 (853–9). R.A.E. 31A (333).

An account is given of the life history, feeding habits, distribution and methods of control of *Cylindrocopturus furnissi*, Buchanan. Its only known food plant is *Pseudotsuga taxifolia*, but it has, until recently, been confused under the name *C. longulus*, Lec., with a number of closely related species that live principally in Pines. Observations made in 1935–41 at La Grande, Washington, in a naturally established stand of 20-year-old trees that had been rather heavily infested for a number of years were supplemented by records from other places in western Washington, Oregon and northwestern California. The weevil is widely distributed but causes relatively little damage except on individual plantations.

Factors that were observed to give natural control were the production of excess pitch by the attacked trees, which killed many eggs and very small larvae, competition for suitable food and living space, and parasitism. Artificial control is considered unnecessary under forest conditions but may be desirable in plantations; no practical measures have been developed.

45.3 : 12.25 : 13.2. GIBSON, A. L. **Penetrating sprays to control the Mountain Pine beetle.** *J. econ. Ent.* 36, 1943 (396–8). [U.S. Bureau of Entomology and Plant Quarantine.]

Tests undertaken for the control of the mountain

Pine beetle (*Dendroctonus monticolae*) in Lodgepole and Whitebark Pine (*Pinus contorta* and *P. albicaulis*) have shown that certain penetrating sprays are highly toxic to the broods beneath the bark. Sprays of Diesel oil and orthodichlorobenzene combined low cost and effectiveness of control to the highest degree of any formula tested. Control by penetrating sprays has the advantage of giving most satisfactory results during the late spring when working conditions are favourable and when the usual methods cannot be used because of the fire hazard. The higher cost of the materials required for penetrating sprays is expected to be offset largely by lower operating costs due to the better working conditions and to the relatively long period during which spraying is possible.

45.3 : 12.25 : 13.2. HAMILTON, C. C. **The Pine sawfly *Neodiprion sertifer* Geoff. and its control with concentrated lead arsenate sprays.** *J. econ. Ent.* 36, 1943 (236–40). [New Jersey Agricultural Exp. Sta.]

The European sawfly (*Neodiprion sertifer* Geoff.) is reported to be increasing in numbers in the United States where it sometimes causes extensive damage, particularly to Red and Scotch Pine (*Pinus resinosa* and *P. sylvestris*). Other important food plants in the United States appear to be *P. densiflora*, *P. banksiana*, *P. montana* and *P. montanta mughus*. It has also been known to feed on *P. strobus* and *P. austriaca* growing in the vicinity of more favoured hosts. The life history and habits of the sawfly are described, and methods of control are indicated. The larvae may readily be killed by the application of concentrated sprays of lead arsenate, using a ground sprayer, the spray being directed through or over the trees so that it drifts down from above. The most suitable time of application appears to be the latter part of April or early May. For trees 10–15 ft. tall, planted 6 ft. × 8 ft., approximately 100 gallons of concentrated spray were required per acre.

45.3 (410) : 12.25 : 13.2. HANSON, H. S. **The control of bark beetles and weevils in coniferous forests in Britain.** *Scot. For. J.* 57, 1943 (19–45).

Attention is drawn to the importance of forest protection, especially the control of injurious insects. The principles of ecological and biological control are discussed, with special reference to pine beetle populations. Lists of the known species of British parasites and predators of Pine beetles are given, and it is suggested that additions to these lists may be expected when the subject receives greater attention by a larger number of observers. Insect control in relation to replanting felled coniferous areas is dealt with in detail, with particular reference to the control of the Pine weevil, *Hylobius*, and the black Pine beetle, *Hylastes*. The breeding habits of these species, and the factors which help to control their increase under normal forest conditions are discussed. *From author's summary.*

45.3 : 12.25 : 13.2 : 24.3. JOHNSON, P. C. **Effectiveness of Pine marking rules in areas of high insect hazard.** *J. For.* 41, 1943 (526–7). [U.S. Bureau of Entomology and Plant Quarantine.]

Reserve Pine stands in northern California are protected against beetle attack by the cutting and utilization of all susceptible trees that are above the economic diameter limit (18 in. d.b.h.). It has been found that such a measure is not adequate in stands of high beetle hazard on poor sites where many of the high-risk trees are below the economic diameter limit. To protect such stands from beetle attack it would be necessary to remove many of the smaller trees. [Cf. *For. Abstr.* 4 (193).]

45.3 : 12.25 : 13.2 : 11.47.1. NETTLES, W. C. **Plant stimulation aids in control of *Pissodes nemorensis* on *Cedrus deodara*.** *J. econ. Ent.* 36, 1943 (345).

Damage to *Cedrus deodara* by the snout weevil, *Pissodes nemorensis*, may be largely prevented by stimulating the growth of the trees with applications of commercial fertilizer or of compost, and by watering during dry periods. It is believed that the invading insects are repulsed by the increased pressure of the sap stream.

45.3 : 12.25 (74) : 13.2. SCHAFFNER, J. V. **Sawflies injurious to conifers in the northeastern states.** *J. For.* 41, 1943 (580–8). [U.S. Bureau of Entomology and Plant Quarantine.]

During the last decade 14 species of sawflies that attack conifers have been abundant, at least locally, for one or more years, in the northeastern United States. Some of these species, six of which are of foreign origin, have increased in importance as pests in recent years, and considerable damage has been caused in some localities, more especially in young plantations of Red, Scotch and Jack Pine, and Spruce. This paper gives a key for the identification of the large larvae of the more important species and a brief account of the life history and general habits of the species, together with information on their food plants, the damage they have caused, and methods of control. The species of sawflies are *Acantholyda erythrocephala*, *Diprion frutetorum*, *D. hercyniae*, *D. simile*, *Neodiprion abietis*, *N. americanum*, *N. banksianae*, *N. dyari*, *N. lecontei*, *N. pinetum*, *N. pini-rigidae*, *N. sertifer*, *N.* n. sp., *Pikonema alaskensis*, *Pristiphora erichsonii*.

45.3 : 12.25 : 13.2. STRUBLE, G. R. **Laboratory propagation of two predators of the Mountain Pine beetle.** *J. econ. Ent.* 35, 1942 (841–4). R.A.E. 31A (332).

From the results of investigations on the feasibility of artificial rearing of predators for liberation against *Dendroctonus monticolae* Hopk. on Sugar Pine (*Pinus lambertiana*) during outbreaks in the western United States, it was found that although both *Temnochila virescens*, F., and *Enoclerus sphegeus*, F., could be reared under artificial conditions from egg to adult in the laboratory, *E. sphegeus* failed to become adapted to the artificial environment. Moreover, the cost of rearing these predators on their native prey is much too high for practical purposes, and the use of the logs necessary to rear the prey is too cumbersome and is wasteful of green timber.

45.3 : 12.26-8 : 13.2 : 13.13-4. PECHUMAN, L. L. **Notes on the biology of *Chyliza notata* (Diptera, Psilidae).** *Bull. Brooklyn ent. Soc. An.s.*) 38, 1943 (97). I.I.E.

Adults of *Chyliza notata* are attracted to exposed wounds on the trunk, branches or cut logs of Elm trees. They appear to feed on the sap and to oviposit around the margins of the wound. The larvae tunnel between the bark and wood into the healthy tissue, and in due course the puparium is formed under the bark. Although theoretically this insect is capable of transmitting the Dutch Elm disease pathogen from

diseased to healthy trees, its importance in this respect is probably not great.

45.3 (74.4) : 12.25-8 : 13.2. ALEXANDER, C. P., and others. **Department of Entomology [Report for 1941].** *Bull. Mass. agric. Exp. Sta.* No. 388, 1942 (50-66). R.A.E. A31 (429–32).

Report on investigations undertaken in Massachusetts during 1941. Incidental records on the overwintering eggs of aphids, including heavy infestations on Birch and Pine and moderate ones on several ornamental trees, showed practically complete kill following the use of dinitro compounds. None of the common deciduous ornamental plants showed ill effects, except for a slight retardation in some cases; moderate scorching was observed on Irish Juniper (*Juniperus communis* var. *hibernica*) and more serious injury on Laurel and Rhododendron. Dormant application of a 5-per-cent. commercial oil emulsion combined with dry-mix dinitro-o-cyclohexylphenol gave economic control of oystershell scale (*Lepidosaphes ulmi*, L.) on Lilac and Willow.

Elm logs that had been cut just before April 1941 were examined at the end of September. Some contained only large larvae of *Scolytus multistriatus*, Marsh., and no emergence holes, while others contained larvae, pupae and young adults of *Hylastes* (*Hylurgopinus*) *rufipes*, Eichh., and many emergence holes, suggesting that *Scolytus* may commonly have one generation a year in this locality (Alford), which is the one where Dutch Elm disease was first found in Massachusetts. Numerous feeding or overwintering tunnels of *H. rufipes* were observed in the tree that was first found to be infected, particularly near the base, and adults were active in the tunnels in the middle of September; there was no apparent correlation between the occurrence of these tunnels and the presence of the causal fungus *Ceratostomella ulmi*.

45.3 : 12.25–8 : 13.2 : 23.27. FELT, E. P., and BROMLEY, S. W. **Shade tree insects and protective concealment in military areas.** *J. econ. Ent.* 36, 1943 (326–7).

Where protective concealment by trees is necessary, particular care should be taken to maintain their vitality and protect them from defoliation by insects. The following insects are among those responsible for defoliation or other extensive damage to trees:—the Elm leaf beetle (*Galerucella xanthomelaena* Schrank), the Japanese beetle (*Popillia japonica* Newmn.), the gypsy moth caterpillar (*Porthetria dispar* Linn.), the spring cankerworm (*Paleacrita vernata* Peck), the fall cankerworm (*Alsophila pometaria* Harr.), the forest tent caterpillar (*Malacosoma disstria* Hubn.), the two-lined Chestnut borer (*Agrilus bilineatus* Web.), the bronze Birch borer (*Agrilus anxius* Gory), the dark Elm bark beetle (*Hylurgopinus rufipes* Eich.), the European Elm bark beetle (*Scolytus multistriatus* Marsh), the Pine bark beetles (especially *Ips pini* Say, and *Ips calligraphus* Germ.), the Spruce bark beetle (*Dendroctonus piceaperda* Hopk.), the Balsam bark beetle (*Pityokteines spasus* Lec.), the Cedar bark beetle (*Phloeosinus dentatus* Say), and the Pine bark beetle (*Dendroctonus frontalis* Zumm.).

Storm damage and defoliation by leaf-eating insects are factors which facilitate borer attack.

45.3 : 12.26–8 (729) : 13.2 : 13.15. CALLAN, E. McC. **Observations on cotton stainers (*Dysdercus* spp.) and their host plants in Jamaica.** *Trop. Agric.* 20, 1943 (113–5). [Imperial College of Tropical Agriculture, Trinidad.]

Three species of cotton stainers occur commonly in Jamaica, viz., *Dysdercus andreae* (L.), *D. sanguinarius* Stål (= *D. jamaicensis* Walk.), and *D. mimulus* Hussey. The staple host plants of these insects in the West Indies belong exclusively to the families Malvaceae, Sterculiaceae, Bombacaceae and Tiliaceae. Of the Bombacaceae, *Ceiba pentandra* Gaertn. and *Ochroma pyramidale* Urb. are well-known tree hosts, and *Sterculia caribaea* R. Br., *S. apetala* Karst. and *Cola acuminata* Schott and Endl., are important stainer hosts of the family Sterculiaceae. Apart from annual and perennial cottons the most important Malvaceous stainer hosts are *Thespesia populnea* Sol., *Hibiscus tiliaceus* L., *H. elatus* Sw. and various herbaceous weeds. The writer's observations were confined mainly to herbaceous host plants occurring on the Liguanea Plain, the Port Royal Mountains and the Blue Mountains of Jamaica.

45.3 : 12.26–8 : 13.2. DODGE, B. O. **The Sycamore plant bug.** *J. N.Y. bot. Gdn.* 44, 1943 (214–5).

Injury to the American Plane (*Platanus occidentalis*) observed in New York Botanical Garden for several years during the month of June is evidently caused by a hemipterous plant bug identified as *Plagiognathus albatus* which feeds on the leaves. Numerous small whitish specks appear on both sides of the leaves, and many irregular, angular holes apparently result from a shrinkage of the leaf tissue following the injection by the bugs of a poisonous substance. The London Plane (*Platanus acerifolia*) is also affected to some extent, but the damage in this case is not severe and is confined largely to a few leaves at the tips of the branches.

45.3 : 12.26–8 : 13.2 (79.4). ESSIG, E. O. **The Cork Oak cynipid in California.** *J. econ. Ent.* 36, 1943 (123–4). [University of California.]

The Cork Oak cynipid, *Plagiotrochus suberi* Weld, infests the smaller twigs of *Quercus suber* L., making its galls within the tissues just beneath the bark. It appears to attack chiefly old trees, the young trees being free or relatively free from infestation, in some cases for 10 to 15 years or more. The insect is widely distributed in the state of California. Even isolated trees 50 miles or more from other Cork Oaks are subject to attack. Control measures consist in cutting out and burning the infested twigs and in improving the general vigour of the tree.

45.3 : 13.2 : 12.26–8 (54) : 31.43. GARDNER, J. C. M. **Entomological notes.** *Indian For.* 69, 1943 (323–4).

The beetle, *Atractocerus reversus*, is reported to attack felled logs of *Boswelia serrata* (a species which has recently assumed considerable importance for box wood) as soon as decay sets in.

Brief notes are included on termites in India and on a plan to maintain certain plants as undergrowth in Teak forests in order that they may act as hosts to parasites of Teak defoliators.

45.3 : 12.26–8 : 13.2. GRAYSON, J. M. **Observations on a lepidopterous borer in Ash.** *J. econ. Ent.* 36, 1943 (479). [Virginia Polytechnic Institute, Blacksburg.]

Observations on the life history and habits of *Podosesia syringae* Harris on White Ash (*Fraxinus americana* L.) are recorded. In late July and in August many of the larvae were parasitized and killed in their burrows by a fungus (*Beauveria* sp.). Excessive

rainfall during the 1942 growing season was probably a factor contributing to the success of the fungus.

45.3 (47.1) : 12.26–8 : 13.2 : 13.15 : 44.3 : 12.21. KANGAS, E. Aspens avtorkning belyst av entomologiske analyser. [**Aspen wilting explained by entomological investigations.**] *Ent. Medd.* 22 (1), 1940 (32–4). Biol. Abstr. 17 (19233).

Many Aspen (*Populus tremula*) in northern Finland have, in recent years, suffered from drying and wilting. Investigations have shown the trees to be infested by a variety of insects and certain fungi. The insects include *Agrilus ater*, *Saperda perforata*, *S. carcharias*, *Xylotrechus rusticus*, *Xyleborus cryptographus*, *Cryphalus bispinulus*, *Erinna* sp., and *Ptilinus fuscus*. *Armillaria mellea* is one of the fungi present. A similar drying takes place in Ash, the insects involved being *Agrilus mendax*, *Saperda scalaris*, *Scolytus rugulosus*, and *Anobium nitidum*. *Agrilus ater* is the most important insect found in connexion with the wilting of Aspen; its habits and development have now been investigated and its biology has been found to differ markedly from that of other species of *Agrilus*.

45.3 : 12.26–8 : 13.2. LEVER, R. J. A. W. **Entomological notes.** *Agric. J. Fiji* 14 (1), 1943 (14–8). R.A.E. A31 (361).

A Scolytid found in June, 1940, in fallen seeds of *Podocarpus vitiensis* was identified as *Coccotrypes* sp. near *dactyliperda*, F.

45.3 : 12.26–8 : 13.2. STRETTON, G. B. **Some observations on the leaf-rolling habits of *Bycticus populi* L. (Col. Curculionidae).** *Ent. mon. Mag.* 79, 1943 (252–5).

In June and July, 1943, the author made observations on *Bycticus populi* on White Poplar. A description is given of the procedure adopted by the female beetle in curling a leaf into the compact, cigar-like cylinder which envelopes the egg. A hymenopterous parasite, *Bracon discoideus*, was frequently observed on the rolls.

45.3 : 12.26–8 : 13.2. WOLFENBARGER, D. O., and JONES, T. H. **Intensity of attacks by *Scolytus multistriatus* at distances from dispersion and convergence points.** *J. econ. Ent.* 36, 1943 (399–402). [U.S. Bureau of Entomology and Plant Quarantine.]

Twig-crotch injuries caused by the smaller European Elm bark beetle (*Scolytus multistriatus*, Marsham) were found more frequently around points of beetle emergence and dispersion than around points of convergence or breeding centres. The degree of crotch injury decreased with the distance from the dispersion point. Brood galleries were found sometimes as much as 4 miles from the place of emergence of the beetles that had constructed them.

5. MENSURATION. INCREMENT. YIELD

5 : 7. PETRINI, S. Skogsuppskattning och skogsekonomi. [**Forest mensuration and forest economics.**] Lars Hökerbergs Bokförlag, Stockholm. 1937. pp. 277 + 3. [Sw.] S.P.S.

A text-book for the use of students in civil engineering at the Swedish Royal Technical College (division for land surveyors). The book is in two parts dealing with mensuration and economics respectively. The first part contains the following 7 chapters:—estimation of single trees; estimation of forest stands; increment; site quality; surveying and mapping; management plans; calculation of the cut. The part on economics contains 16 chapters:—characteristics of forestry; the principle of interest in forestry; costs; value on the stump; soil value; the expectation value of a forest stand; the change in soil value with change in management; maximum cost of a change in management; cutting and regeneration; drainage; the normal forest; forest trees; soil classification and forest valuation in land surveying; the consumption of wood on farms of different sizes; calculation of the interest in forestry; forest valuation.

52. MEASUREMENT OF TREES AND TIMBER

52.3. *Taper*

52.3 : 12.25 : 21.61 : 24.25. HAGBERG, N. Stamformens förändringar hos tall och gran under bestandsutvecklingen och efter friställning. [**Change in the form of Pine and Spruce during the development of the stand and after heavy thinnings.**] *Svenska SkogsvFören. Tidskr.* 40, 1942 (1–46). [Sw.g.]

A study was made of the form of 483 sample trees of Pine and Spruce selected in central and northern Sweden. In general the form quotient increased rapidly during the early stages of development in a closed stand and then remained fairly constant. Although the form of individual trees varied considerably from the average, the progress of the curves was nearly parallel, i.e., those trees with initially high form quotients maintained relatively high values throughout. Following a heavy thinning there was a tendency towards a lowering of the form quotient of the remaining trees.

52.4. *Measurement of Volume*

52.4 : 33.17 : 33.91. SCHUMACHER, F. X., and YOUNG, H. E. **Empirical log rules according to species groups and lumber grades.** *J. For.* 41, 1943 (511–8). [Duke University, Durham, N.C.]

The theory of the empirical log rule, based upon the working day as the sampling unit, is used (1) to distinguish the effect of different timber species on the volume of lumber manufactured from sawlogs of the same dimension; and (2) to determine the distribution of lumber, manufactured from sawlogs of given dimension, among standard lumber grades. In one case the lumber production varied almost directly with log diameter and no difference in production from sawlogs of the same size could be distinguished as between the two species Pine and Yellow Poplar; in a second mill study, however, lumber production from sawlogs of a given dimension depended to a considerable extent upon the species group involved.

It is demonstrated that the problem of the graded log rule is readily solvable upon providing for the contingency that the volume of lumber contained within the raw sawlog is not independently distributed among standard lumber grades. The solution is effected for a group of Oak logs consumed by a hardwood mill during one month, through the device of expressing independent comparisons among the grades in terms of sawlog dimension. *From authors' summary.*

52.43.2 : 01.7 : 12.25. LEXEN, B. **Short cutting the scaling job.** *Timberman* 44 (9), 1942–43 (20, 22–3, 26, 28, 30). [Rocky Mountain Forest and Range Exp. Sta.]

The author discusses the application of sampling to the scaling of log volumes, and indicates the methods and types of samples that give most satisfactory results, the precautions to be observed in sampling, and how the correct sample size can be determined for any degree of accuracy required. The discussion is based on a study of four sets of 10,000 Ponderosa-Pine logs and one set of 10,000 Lodgepole-Pine logs. [Cf. *For. Abstr.* 3 (259).]

52.43.2 (73). **National forest scaling handbook.** U.S.D.A. Forest Service, Washington, D.C. (Revised ed.) 1941. pp. v + 119.

This handbook discusses briefly the policy of, and gives instructions for, the scaling of timber cut on the national forests in the United States. The log rules used (Scribner decimal C and International ¼-inch rules) and certain related data are given in the appendix.

52.43.2 (74.9). MOORE, E. B. **A defense of the Doyle log rule in New Jersey.** With comments by H. H. Chapman. *J. For.* 41, 1943 (577–80). [New Jersey Department of Conservation and Development.]

In New Jersey, sawlogs are usually cut to the full merchantable length of the tree, often being 25–45 ft. long. In scaling, the bark is removed at the middle of the log, the diameter being measured to the nearest inch; these measurements and log lengths are used with the Doyle rule to determine log volumes. Scaling of 154 hardwood logs averaging 17·4 in. in middle diameter and 30 ft. long by this method gave bd.-ft. contents slightly in excess of those given by the International ¼-inch rule. It is suggested that, when properly applied, the Doyle rule gives satisfactory results under New Jersey conditions.

52.43.3 : 12.25. HALLIN, W. E. **Unusual volume tables.** With addendum by F. X. Schumacher. *J. For.* 41, 1943 (681–2). [California Forest and Range Exp. Sta., Berkeley, Calif.]

A brief note on conditions and problems relating to the preparation of volume and taper tables for old-growth coastal Redwood. [Cf. *For. Abstr.* 3 (172).]

52.43.3 : 12.25–8 (75.4–7 : 76.8–9). BUELL, J. H. **Outside-bark form class volume tables for some southern Appalachian species.** *Tech. Note Appal. For. Exp. Sta.* No. 53, 1942. pp. 10 + tbls.

Board-foot volume tables are given for 16 important tree species of the Appalachian and mid-Atlantic states. Each table gives tree volumes by various combinations of d.b.h. and merchantable height for a fixed 'outside-bark' form; it is possible, by simple multiplication, to convert these volumes to volumes for other form classes as required.

52.46. Strip Surveys. Enumerations. Timber Cruising

52.46 : 01.7. HASEL, A. A. **Estimation of volume in timber stands by strip sampling.** *Ann. math. Statist.* 13 (2), 1942 (179–206). [California Forest and Range Exp. Sta.]

Several methods of sampling timber stands and statistical treatment of the samples are considered. Data from a complete inventory of 4,402 acres of the Blacks Mountain Experimental Forest, northern California, served for testing the methods in practice.

It was found that the usual method of estimating from strip samples taken within nonrectangular blocks of timber gave biased estimates, unless the linear regression of volume on strip length passed through the origin of coordinates. It was shown that this condition was not a safe one to assume, and methods were sought that were freed from this restriction.

The appropriate formulae for the best linear unbiased estimates were deduced under various combinations of the following assumptions:—

(1) That the regression of timber volume on strip length is strictly linear, but may or may not pass through the origin of coordinates.

(2) That the values of the $(S.D.)^2$ of timber volumes on strips of equal lengths are (*a*) constant for different strip lengths, (*b*) proportional to strip length, and (*c*) proportional to the square root of strip length.

(3) That the number of strips of a given length in each block is (*a*) finite, and (*b*) infinite. Assumption (*b*) was based on intuitive considerations which indicated that this assumption, though known to be false, might compensate for another false assumption, namely, that of strict linearity of regression.

It was empirically found that assumption (*b*) of (2) gave better results than either (*a*) or (*c*). However, the advantage was small and, in the author's opinion, did not justify the extra labour in calculations which are simpler when assumption (*a*) is made. Therefore all other calculations were made on that assumption.

An extensive sampling experiment was made to test whether the smallness of the samples combined with the conflicts between assumptions of the theory and the actual facts, influenced the validity of the normal theory.

Whenever the sample did not exhaust strips of a given length, it was found that the formulae based on the assumptions that the populations of such strips are finite and that they are infinite both work satisfactorily, generating distributions similar to those determined by the normal theory. However, the confidence intervals based on the true assumption that the populations of strips of equal length are finite, proved to be narrower. Consequently, whenever the sample does not exhaust all strips of any given length in the block, the true hypothesis concerning the number of such strips should be used.

In cases where the sample did exhaust the strips of a given length, the treatment of the number of such strips as finite, combined with the inaccuracy of the assumption that the regression of timber volume on length of strip is linear, resulted in marked disagreement between the actual distributions of statistics and those based on normal theory. This disagreement was not found to exist in statistics based on an infinity of strips of a given length. This suggests the conclusion that the exhaustion of strips of a given length by the sample should be avoided and, when this is impossible, then the formulae based on the assumption of an infinity of strips of a given length should be used.

The formulae deduced can be applied equally well to line plots as to strips. With these formulae the most efficient sampling will be obtained when the average sample strip length is close to the average for the population, but where the variation among sample strip lengths is the maximum. *From author's summary.*

52.46 : 01.7. OSBORNE, J. G. **Sampling errors of systematic and random surveys of cover-type areas.**

J. Amer. statist. Ass. 37, 1942 (256–64). [U.S. Forest Service.]

This paper is of considerable interest to any who are engaged in determining the proportionate area occupied within a region by different types of land utilization, or natural vegetation and such like cover-types. The author is concerned to show the relative value and efficiency of completely random, stratified random and systematic methods of sampling in carrying out the necessary surveys. The three types of sampling were carried out by superimposing appropriately laid out lines across a map showing various cover-types, viz.: cultivated land and uncultivated land divided in suitable classes. The result of the investigation showed that the mean area of cultivated land estimated was practically the same for all three types of sampling. Stratified random sampling appears, however, as being much more efficient than completely random sampling but only one-half to one-fourth as efficient as systematic sampling.

The efficiency of the estimate is measured by determining its standard error and it increases as the standard error becomes smaller. Random sampling formulae, for calculating this error, are suitable for use only with randomly selected observations. Biased estimates of error are obtained if they are used with data selected systematically. It is demonstrated in the paper that dependable estimates of the sampling error of a systematically collected sample are obtained from estimates of the correlation of measured and unmeasured survey lines. The interest of this paper to the practical forester is firstly the demonstration of the relative efficiency of systematic sampling as a means of obtaining an estimate of land areas and, secondly, the insistence that the method of estimating sampling error must be appropriate to the sampling method.

52.46 : 01.7. PROUDFOOT, M. J. **Sampling with transverse traverse lines.** *J. Amer. statist. Ass.* 37, 1942 (265–70). [U.S. Bureau of the Census.]

This paper discusses a traverse method of estimating the quantity and distribution of various types of land. The advantage of such a method is that a map of adequate accuracy, together with estimates of the proportionate area of the different land types, may be obtained at lower cost and in shorter time than with detailed mapping. The importance of the ratio of the total length of the traverse lines to the average intercept of the land types crossed is discussed. It is shown from an example that a high degree of correlation between the proportionate areas estimated by traverse and measured by planimeter can be obtained if this ratio is kept sufficiently high. It is possible to estimate beforehand the intervals at which traverse should be made to give a sufficiently high ratio. [Cf. preceding abstract.]

53. SOLID CONTENTS OF STACKED MATERIALS. REDUCING FACTORS

53 : 01.4. KEEPERS, C. H. **A new method of wood evaluation.** *Paper Tr. J.* 117 (9), 1943 (23–7). [Nekoosa-Edwards Paper Co., Port Edwards, Wis.] P.R.

The solid wood content of a cord (128 cu. ft.) may vary greatly depending upon the preparation of wood before piling, the selection of diameter sizes, and the length of bolts into which trees are cut. Methods that have been used in the past for determining actual wood content are generally time-consuming and costly. This paper describes a new method for determining accurately without undue delay the volume of wood in a stack of bolts or logs. A photograph is taken showing a side elevation of the pile of wood, the photograph is enlarged to 5 × 7 in. and is placed in the frame of a specially constructed instrument by means of which the percentage of wood area and air space can be determined, after which the solid-wood content per cord can be calculated. To determine the actual solid content of a pile of logs it is necessary to have the overall dimensions of the pile; these may be obtained either by direct measurement or by including measuring rods in the photograph. The practical application of this method is discussed with examples.

56. INCREMENT

56 : 12.25 (79.5) : 21.6. BRIEGLEB, P. A. **Growth of Ponderosa Pine by Keen tree class.** *For. Res. Note Pacif. N.W. For. & Range Exp. Sta.* No. 32, 1943. pp. 15.

The Keen tree classification [cf. *J. For.* 34, 1936 (919–27)] was developed for the purpose of estimating the probable future growth and mortality of individual Ponderosa Pines. This paper presents the results of a comprehensive study of growth rates, by Keen tree classes, of virgin Ponderosa Pine in Oregon, based on increment-core and other measurements from some 8,000 sample trees on thirty 10-acre permanent sample plots. The diameter growth for all tree classes as a group averaged about ¾ in. per decade. For the youngest, most vigorous trees the diameter growth averaged about 1½ in., while for the oldest, least vigorous trees it averaged about ¼ in. per decade.

56.02 : 12.25 : 11.21 : 24.36. EKLUND, B. Studier över åraringsvariationerna å Malingsbo fasta provyta nr 1. **[Studies on annual ring variations on the permanent sample plot no. 1 at Malingsbo.]** *Svenska SkogsvFören. Tidskr.* 40, 1942 (233–310). [Sw.]

A study was made of increment cores from the four quarters of each of 48 Pine trees and of the influence of climate and fellings on increment. The difference in width of ring for any two consecutive years averaged 10 per cent. The difference in increment for any two consecutive periods of five or ten years was often as much as 20 to 30 per cent. Cores from the east side of the trees showed the widest and those from the west side the narrowest annual rings. It is pointed out that variations of this type should be taken into account in making increment studies.

56.02 (79.8) : 12.25 : 11.11 : 11.21. GIDDINGS, J. L. **Some climatic aspects of tree growth in Alaska.** *Tree-Ring Bull.* 9, 1943 (26–32).

Tree-ring data were obtained in 1942 from nine groups of living Spruce trees situated at about 50-mile intervals along the Yukon River, and from one group on the Kuskokwim River, Alaska. Particular attention is given to the significance of temperature as a factor influencing tree growth.

56.02 : 24.36. JOHANSSON, S. Tillväxtens lokalisering hos träden efter huggningar. **[Localization of growth in trees following cutting.]** *Skogen* 28, 1941 (229–30). [Sw.]

From a study of increment borings it was found that in a closed stand there is little difference in the width of the annual ring at breast height, stump height and in the root, growth in these three regions being uniform.

Soon after cutting the residual trees frequently show a marked increase in the width of annual ring in the root and at the base of the trunk; in general the annual rings at breast height do not increase in width for several years and in fact may show a reduction in size during the period immediately following cutting.

57. DEVELOPMENT AND STRUCTURE OF STANDS. YIELD

57.9 : 12.26–8 (485) : 23.51. PETRINI, S. Boniteringstabeller och tillväxtöversikter för ek. **[Yield tables for Swedish Oak stands.]** *Medd. Skogsförsöksanst. Stockh.* 33, 1942 (213–46). [Sw.g.]

The Oak is fairly common in that part of Sweden south of Stockholm though it is not usually found in regular stands. During the past twenty years the Swedish Institute of Experimental Forestry has been studying 19 sample plots of this species that have been thinned every fifth year, and the data obtained from this work has been used in the construction of yield tables. The same system and classes for site quality have been used as in the Danish yield tables for Oak, published in 1933 (C. M. Møller in *Dansk Skovforen. Tidsskr.*) The deviations of the Swedish data from those given in the Danish tables were determined statistically as a basis for the construction of the Swedish tables. In each of the four site classes the yield from Swedish stands is less than that from Danish stands, the difference being 20–25 per cent. for the volume measured in solid cu. m. Derbholz (> 7 cm. in diameter).

A tolerant tree species is required as an understorey to the very intolerant Oak. In southern Sweden this will be Beech but further north Spruce (*Picea abies*) is excellent for this purpose. The Spruce, which must be heavily thinned at frequent intervals, will have two rotations for each rotation of Oak.

6. MANAGEMENT. WORKING PLANS. SURVEYS

60. GENERAL LAND MANAGEMENT

60 (74.7) : 97.1 : 12.26–8. GUSTAFSON, A. F. **Soil and field-crop management for the Catskill-Mohawk area of New York.** *Bull. Cornell agric. Exp. Sta.* No. 789, 1942. pp. 32. A.P.B.

A short section at the end of this publication is devoted to forests as a farm crop in the Catskill-Mohawk area. The desirability of reforestation, particularly on the steeper, less productive meadows is emphasized, and the Sugar Maple is recommended as a suitable species for this purpose. In addition, the production of trees suitable for posts, lumber and fuel deserves consideration.

60.3. *Management of Different Classes of Forest*

60.3 (71.3) : 91 : 97 : 43.1 : 23.3. **The history and status of forestry in Ontario.** Department of Lands and Forests, Ontario. 1943. pp. 36.

This booklet, prepared by the Department of Lands and Forests, Ontario, deals with the history of forestry and forest legislation in the province from the time of the earliest settlers until the present day. It is divided into 5 main sections:—(1) Land administration, settlement and recreation; (2) Timber management in Ontario; (3) Forest fire protection in Ontario; (4) Reforestation in Ontario; and (5) Ontario forests in post-war rehabilitation.

60.31 (71.4) : 12.19.2 : 22.14.2 : 4 : 32.92. ROBERTSON, W. M. **Some observations on a tour of the Montmorency forests.** *Pulp Paper Mag. Can.* 44, 1943 (664–6).

A brief account is given of forest types and conditions, cutting practices and operating problems on the Montmorency limits of the Anglo-Canadian Company, which comprise 400 sq. miles of forest land in Montmorency County north-east of Quebec City. The allowable cut of pulpwood for the area as a whole is 120,000 cords per year on a 60-year rotation which is divided into three 20-year cutting cycles. As much of the present stand is mature and as it is desired to adjust the stand to three age groups—reproduction, immature and mature—cutting during the first cycle has been at the rate of about 150,000 cords per year.

The principal cover type in the southern part of the area is the Yellow Birch/Balsam Fir/Spruce type in which the conifers are being cut to a 7-in. diameter limit, and at present mature hardwoods are being cut for fuelwood. The Balsam Fir/Spruce/White Birch type in the northern section is liable to wind damage following partial cutting and therefore the diameter-limit system is not applicable. Clear-cutting in selected groups is the method used, one-third of the area being covered every twenty years.

Transportation of logs down the steep mountain sides is accomplished by use of the numerous streams, on each of which a series of inexpensive dams of special construction have been built, a few hundred feet apart. In this way logs are floated in stages from one dam to the next, full use being made of the spring freshet.

60.31 (78.9 : 79.1) : 32. HALL, J. S. **Cooperative timber harvesting agreements in the southwest.** *J. For.* 41, 1943 (596–9). [U.S. Forest Service.]

The author discusses briefly the history, operation, advantages and drawbacks of the co-operative agreements undertaken in Arizona and New Mexico whereby the U.S. Forest Service has administered, in whole or in part, many of the timber sales in that region.

60.31.1 (79.5) : 8 : 94.1. WILLISON, C. H. **Who manages Oregon's public forest land?** *W. Cst. Lumberm.* 70 (7), 1943 (44, 46, 48). [Oregon State College.]

Forty-three per cent. of the forest land of western Oregon is controlled by eight different public agencies. These are the U.S. Forest Service, the Oregon and California Revested Lands Administration, the National Park Service, the Indian Service, the State Forestry Department, the State Highway Department (State Parks), and county and municipal authorities. The writer discusses the areas controlled by each of these authorities and their policy of administration, particularly as it affects the logger in buying stumpage.

60.31.2 (485) : 97.2. STREYFFERT, T. Bonde skogarnas ekonomi. **[The management of farm woodlands.]** *K. Lantbr. Akad. Tidskr.* 79 (6), 1940 (451–64). [Sw.e.] A.P.B.

Farm woodlands comprise approximately 27 million acres, or about 47 per cent. of the total productive forest area of Sweden. Their economic importance is

increased by the fact that most of them are situated in the southern half of the country where growing conditions and marketing facilities are better than in the north. As the incomes of individual farmers are largely dependent on the logging and floating of timber and on the sale of stumpage, and as an average of 40 to 50 per cent. of the total value of Swedish exports is derived from forest products, it is not surprising that the public authorities should display considerable interest in the care and management of farm woodlands. The County Forestry Boards inaugurated in 1905 were primarily concerned with improving conditions in this class of forest. In spite of the excellent work done by these organizations, in which the forest owners themselves take a leading part, public opinion is still inclined to think that farm woodlands are not as well managed as other types of forest areas. This view is not confirmed by facts, although it is admitted that (1) the division of forest areas among a large number of owners (about 280,000 in all) of rather small financial means often results in constant demands on the marketable stands; (2) grazing of cattle in the forests may sometimes be responsible for reduced tree growth; and (3) the supply of fuelwood and other timber for use on the farm is sometimes obtained without due regard to good forest management. On the other hand, farmers have special opportunities for intensive forestry owing to their surplus labour supply, and it is possible to use on the farm small or otherwise less valuable wood obtained from thinnings which could not normally find a market.

The national survey of Swedish forests, which was begun in Norrland in 1938, has definitely established that in this part of the country, at least, stands of timber belonging to farmers are not generally inferior to those belonging to the state or to the pulp and lumber companies. This does not mean that conditions are everywhere satisfactory, but it does suggest that the present policy of improving these woodlands may confidently be continued on the same general principles.

60.31.2 (77.4) : 65.7. MONROE, A. F. **Managing farm woodlands of the Oak-Hickory type.** *Pap. Mich. Acad. Sci.* 28, 1942 (261–7). [U.S. Soil Conservation Service, Howell, Michigan.] O.B.

A survey of the Oak/Hickory farm woodlands of southern Michigan indicates that they are understocked and contain a great deal of low-grade material. While protection alone sometimes results in marked improvement it is not usually sufficient in itself to ensure good stocking; intensive management will be necessary before proper stocking can be obtained in these woods. Furrowing and disking in existing woodlands will have a favourable influence on restocking, but salvage and improvement cuttings are also needed.

60.31.2 (79.4) : 12.25 : 94.3. KRUEGER, M. E. **Condition of privately owned cutover lands in California.** *J. For.* 41, 1943 (659–65). [University of California, Berkeley, Calif.]

This article presents the results of an extensive survey of the privately owned cut-over forest lands in California, made by the author in the summer of 1942. It indicates that cutting practices have improved materially in the last 10–20 years in both the Redwood and Pine regions, particularly the latter, but that present methods of logging still leave much to be desired. State legislation requiring cutting to a diameter limit in the Pine region and the leaving of seed trees in the Redwood region is recommended as the only means of assuring that all cut-over areas will have a cover of vegetation consisting primarily of tree species. Further study by the lumber industry of the possibilities of selective logging is urged, as is also a large-scale intensive study of all cut-over lands in the State, both public and private.

60.32 (481) : 22.12.2. RUDEN, T. Litt om vernskogen mot fjellet og dens behandling. **[Notes on the protection forest in the mountains and its treatment.]** *Tidskr. Skogbr.* No. 7–8–9, 1943 (113–30). [Nor.]

A large part of the forest area of Norway may be classified as protection forest. Various factors that are of importance in relation to the growth and regeneration of these forests, such as temperature, wind, grazing, snow, etc., are discussed in this paper. Ideas of how best to treat these forests have changed considerably from time to time. For some time the wind was considered to be the significant factor in selecting the system of felling, while more recent investigations suggest that temperature is the factor of greatest importance.

The old idea of cutting in such a way that the remaining trees will always give shelter to the younger members of the stand may result in too low a soil temperature. The author proposes a series of three parallel strips each 30 m. wide, the first to be clear-felled, the second to be thinned and the third to remain uncut. The higher temperature on the clear-felled area will give the seed a better chance to germinate, and the seedlings will obtain more and better nourishment from the decomposing litter. The trees in the thinned strip will have increased growth enabling them to produce more seed for the clear-felled strip.

Other methods of treatment are discussed for Spruce, Pine and Birch forests. FINN FROST.

61 SURVEYING. MAPPING

61 : 23.26 : 01.7. JOHNSON, F. A. **A statistical study of sampling methods for tree nursery inventories.** *J. For.* 41, 1943 (674–9).

A study was undertaken to determine the most effective method of sampling forest-tree nursery stock for inventory purposes. Consideration was given to (1) the type of sample to be used, (2) the number of samples to be taken, and (3) the selection of the sample.

For beds in which the trees were planted in rows, variances were calculated for each of three sizes in each of two types of sampling units. In the first type were the 1-, 2-, and 3-ft.-row units, including respectively 1-, 2-, and 3-ft. lengths of a single row of trees. In the second type there were 1-, 2-, and 3-ft.-bed-width units, including respectively 1-, 2-, and 3-ft. lengths of all rows across the width of the bed. For beds in which the trees were not planted in rows only three sizes of bed-width units were considered. A 6-in. sampling frame was used giving 0·5-, 1-, and 1·5-ft.-bed-width units.

For hardwood seedbeds the 1- and 2-ft.-row and 1-ft.-bed-width units appeared to be most efficient. For coniferous seedbeds there was some evidence of the superiority of 1- and 2-ft.-row units. For coniferous seedbeds sown broadcast, the smallest of the bed-width units was consistently superior to the wider units.

The 1-ft.-bed-width unit was the most efficient unit for use in coniferous transplant beds.

A method has been developed for determining in advance the size of random samples which will be consistent with the accuracy desired for the estimated total number of trees.

For seedbed stock the systematic samples proved to be more accurate than stratified random samples, but in the transplant beds neither method was consistently more accurate than the other. The superiority of the stratified random method of sampling over the completely random method was demonstrated.

64. DESCRIPTION OF SITE. ASSESSMENT OF SITE AND STAND QUALITY

64 (76.4) : 12.25 : 11.49 : 56. CHANDLER, R. F., SCHOEN, P. W., and ANDERSON, D. A. **Relation between soil types and growth of Loblolly Pine and Shortleaf Pine in East Texas.** *J. For.* 41, 1943 (505–6).

In a study undertaken in the East Texas Pine Belt to determine the relation between soil characteristics and tree growth it was found that soil type was the best indicator of site quality for Loblolly and Shortleaf Pines.

65. DESCRIPTION OF GROWING STOCK

65 : 01.4. VESTAL, A. G. **Unequal scales for rating species in communities.** *Amer. J. Bot.* 30, 1943 (305–10). [University of Illinois, Urbana, Illinois.] O.B.D.

A principal object of this study has been to find an unequally ten-parted (and a cognate five-parted) scale for evaluating importance of species: a scale more smoothly graduated than some which have been used. Some of the published unequal scales are briefly reviewed. The recommended scales are based on a progression giving, in a total range of 100 units, an initial class-range of 2·5, and a range for the last class of 20·9 units, or in the five-class form, 6·2 and 38·2 units respectively. Such scales may have their smallest steps either at the bottom or at the top, as applications may indicate.

Examples are given of the different ratings obtained by application of three different scales to data on frequency of occurrence in plots of tree species, and of the use of scales to help distinguish dominant and subdominant groups of species in mixed forest. In this, a ratio is used to place basal-area ratings (as percentage of stand) in numerical accord with class limits.

Since gradings by means of scales are to a degree subjective and arbitrary, findings from their use are usually indicative, rarely conclusive. One can better judge which scale to apply to a given set of data by applying more than one, and comparing the results. *Author's summary.*

65.6. PETRINI, S. Normalskogsformler. [**Formulas for the ideal forest.**] *Svenska SkogsvFören. Tidskr.* 39, 1941 (1–18). [Sw.g.]

Although the ideal or normal forest is a useful reference in connexion with work on soil values and other problems of profitableness in forestry, formulas that are based on or related to a normal growing stock are of little practical value in modern forestry in which thinnings play an important part. The author refers to a number of formulas that are in this category.

65.7 : 07.7. WRIGHT, J. G. **Measurement of the degree of shading or crown canopy density in forest sites.** *For. Chron.* 19, 1943 (183–5). [Dominion Forest Service, Ottawa.]

Tests were made with a C.G.E. Photo Exposure Meter in comparison with a Clements Photometer as a means of measuring the crown canopy density of forest stands. It is concluded that reliable measurements can be made with a photo-electric exposure meter if the readings are taken on a day when the sky is uniformly overcast so that the sun is completely covered.

65.7 : 12.26–8 : 11.44. HELLNER, K. **Tree density and density of soil vegetation in Beech woods.** *Tidsskr. Skogbr.* 49, 1941 (22–5). [Nor.] S.P.S.

Data obtained in a strip survey is used to demonstrate the inverse relation between the area of living ground cover within a stand and the density of stand. In three Beech woods studied, each with a different type of ground vegetation, the basal area of the stand was found to be approximately 0·6 per cent. of the area of ground not bearing green plants.

7. FOREST ECONOMICS, VALUATION, AND FINANCE

7 (73). BUTTRICK, P. L. **Forest economics and finance.** John Wiley & Sons, Inc., New York. Chapman & Hall, Ltd., London. 1943. pp. 484. $4.50.

This book is written for students interested in American forestry, and it has to be considered from that point of view. It is, essentially, an elementary text suitable for those who are making a first reading in the subjects with which it is concerned. There are three parts: the first is concerned with the economic and financial bases of forest enterprises, the second with special economic factors in forestry, and the third with forestry as a private and a public enterprise.

The first part deals with the financial organization and the analysis of forestry as an economic enterprise. A great deal of the discussion is elementary and provides information which should be, but very often is not, part of the general knowledge of forestry students. Problems relating to the financial organization of forest enterprises are discussed. There is a clear and simple discussion on capital and credit, interest and discount, and on the analysis of financial results.

The second part of the book is mainly economic rather than financial and consists of a discussion of forestry problems in which economic principles are referred to and explained when necessary. Subjects that are discussed include the economic and social value of forests; the economics of forest exploitation and conservation; land as a basis of forest enterprise; costs and profits in forestry; sustained-yield forestry; the economics of protection, recreation and wild-life management; forest taxation, tariffs and insurance; and the appraisal of forest values. The discussion is developed from an historical standpoint so that the reader obtains a view of the development of forest exploitation, and, eventually, of the rise of forest conservation in relation to progressive development in the United States during the past hundred years.

The third part of the book discusses the status of forestry as an enterprise for public or private development. This naturally reflects the period of change through which forestry in the United States is passing at the present time, when high-class accessible virgin

forests are approaching exhaustion, and the exploitation of second-growth stands containing trees of relatively inferior size and quality is becoming increasingly important. The factors that operate to make difficult or to favour the development of efficient forest management by private or public bodies in the United States are set out and, in a final chapter, the question of public assistance for, and public regulation of, private forests is considered.

This is a well-produced and interestingly written book. Illustrations in the form of diagrams and tables are adequate and well set out. The style is clear and the author has a good sense of proportion when controversial questions are being discussed. The reader is given the impression that he is being guided through the maze of forest financial and economic problems by one who has an intimate acquaintance with the business side of forestry and writes with the authority that can only be obtained by personal experience. This is undoubtedly in part a fireside book, in that it provides a considerable amount of light though soundly written reading for studious foresters. It is not to be despised because of that; on the contrary, there must be many who could read it to great advantage. The production of such a book as this makes it plain that the problems of forestry education are in some ways very different in the United States from those in Britain. The presence of a large industry concerned with the exploitation of vast, even though much denuded, forests makes it inevitable that the economic and financial aspects of forestry shall receive more attention than in Britain, where exploitable forests are, especially after four years of war, mainly remarkable by their absence. Writing from a distance one is inclined, with some trepidation, to wonder whether one would not obtain better economists and financiers, and not less good foresters, if an adequate fundamental background were given before the student was confronted with the applied forestry aspect. Forest finance and forest economics are essentially practical subjects which are only appreciated adequately as the result of personal professional experience. The forestry student, necessarily inexperienced, is able to appreciate general principles but finds it difficult to comprehend and still more difficult to remember any considerable amount regarding data concerning problems which have not yet come within his practical experience. If this be true, then the economics and finance of forestry should be a study for the older, and preferably post-graduate, student, who has already received an adequate fundamental education and who is beginning to acquire his professional experience. It is doubtful whether this book is adequate for students of this type, except as an introductory text which gives a bird's-eye view of a large field. The ground covered is very wide and, in spite of the size of the book, the level of discussion is usually too general or too elementary to make it of much value as a book of reference, except in so far as it would lead the reader to more advanced literature. The value one finally attaches to this book will probably depend on the attitude held towards forestry education. If the conviction is that the education of the undergraduate student should be of a fundamental nature, even in a technical subject such as Forestry, then this is a text which one will tend not to use for the more serious work, however interesting it may be as an introductory survey covering a very wide field.

The use of such a book as this in Britain, or in any country outside North America, is necessarily limited by the fact that it is concerned, and of course quite rightly from the point of view from which it was written, entirely with forestry in the U.S.A. There is undoubtedly room in Europe for a work which would cover the historical aspect of this text and show the economic development of forestry taking the European continent as a whole, or at least those central and western parts which have had most influence on British trade and forestry practice. This would, however, be much more difficult and complex to produce than any similar text on the United States only. We may be grateful to the author of this book for having reminded us how very deficient in satisfactory economic texts British forestry is and for having presented us with a very readable, informative and pleasant work, which is provided with adequate literature references and a good index and table of contents. W. R. D.

[See also *J. For.* 41, 1943 (453).]

76. MANAGEMENT STATISTICS

76 · 12 25 : 52.43.2 : 32.81 : 33.17. LODEWICK, J. E. **West coast log values, 2. Western Hemlock from the Washington Cascades.** *Prod. Pap. Pacif. N.W. For. & Range Exp. Sta.* No. 4, 1943. pp. 28.

An account of studies undertaken to determine milling costs and the financial returns from the sale of sawn timber for logs from the lower slopes of the Cascades in west-central Washington.

76.1 : 23 : 12.25. **Cost of growing Douglas Fir timber.** *W. Cst. Lumberm.* 70 (4), 1943 (60, 64). [Willamette Valley Tree Farms, Eugene, Oregon.]

Data are given to show (1) the basic costs per acre of growing Douglas Fir timber with different degrees of planting, together with periodic increases at 3 per cent. compound interest, (2) the cost of growing Douglas Fir timber, per thousand bd. ft., on average forest land with different degrees of planting, and (3) the cost of growing Douglas Fir timber, per thousand bd. ft., with various site qualities.

It is concluded that Douglas Fir timber can be grown at a reasonable stumpage cost even when planting costs, high fire-protection costs and fair compound interest rates are involved. Differences in quality of land can make a difference of nearly $5·00 per thousand bd. ft. in stumpage costs.

8. ADMINISTRATION

82. LABOUR QUESTIONS

82 (485). NYSTRÖM, B. Arbetsförtjänsterna i skogarna 1922–1941. **[Wages in the forests from 1922–1941.]** *Skogen* 28, 1941 (207–8). [Sw.]

During the two-year period from the autumn of 1939 to 1941, the wages of forest workers for Sweden as a whole increased by approximately 30 per cent.

86. TOURS OF INSPECTION

86 (54.5) : 11.62.11 : 33.17. HOWARD, Sir H. **Note on a tour of inspection in the forests of the Punjab.** [Forest Research Institute, Dehra Dun.] 1943. pp. 6.

This note refers particularly to the counter-erosion work being undertaken in the Hoshiarpur District of the Punjab [cf. *For. Abstr.* 5 (13).]

In this connexion the importance of closure of the land and re-establishment of vegetation is emphasized.

Reference is made to a development in sawmilling whereby a number of small independently owned and independently powered band-saw mills are brought together in one place under one management. It is suggested that such an industry may be capable of extensive development in the future.

9. FOREST POLICY

9 (410) : 98.1 : 91 : 94 : 95.1 : 07.1–2 : 4 : 8. GREAT BRITAIN. **Post-war forest policy. Report by H.M. Forestry Commissioners.** H.M. Stationery Office, York House, Kingsway, London, W.C.2. 1943. pp. 114.

Britain has a lower area percentage of forest than any other European power. The area of British woodlands is estimated at 3,067,000 acres, which corresponds to only about 5·5 per cent. of the total land area, and to about 6·3 per cent. of the area devoted to agriculture and forestry. More than 80 per cent. of the forest land is under private ownership. Much of this is in an unsatisfactory state and it is probable that less than one-half of the total area is even reasonably productive. Extensive areas of private woodlands were clear-cut during the last war and have never been replanted; the area of such devastated forest land is extending rapidly at the present time.

In the past, home-grown timber has made a relatively small contribution to the wood requirements of the country—about 4 per cent. in recent years. The balance (96 per cent.), including unmanufactured timber, pulpwood and wood manufactures, has been imported from various European countries and North America. The average annual value of these imports for the period 1934–8 was nearly £63 million.

Up to 1914 the management of private British woodlands was left entirely to the discretion of the owner—there was no national forest policy. During the war of 1914–8 practically all the former sources of timber supply became inaccessible and the country came to realize the importance of an adequate supply of home-grown timber under conditions of emergency. In 1916 a Reconstruction Sub-Committee (Acland Committee) was appointed 'to consider and report upon the best means of conserving and developing the woodland and forestry resources of the United Kingdom, having regard to the experiences gained during the war'. Their report, published in 1918, made various recommendations with the object of increasing and improving the forests of Britain. Following this report, a forest policy for the country was drawn up and approved, and the Forestry Commission was established in 1919 as the Forest Authority. The forest policy included a programme of State afforestation and the maintenance of existing woodlands in a productive state.

During the 20 years between 1919 and 1939 the Forestry Commission acquired a forest estate aggregating 714,000 acres of plantable land; of this total, 434,000 acres were under forest by the end of 1939. This was in keeping with the programme of State afforestation. At the same time progress with private woodlands was not satisfactory. There had been virtually no State control over private forestry and State assistance was very limited, consisting mainly in the provision of technical advice, where it was sought, and of planting grants (at the rate of £2 per acre for conifers and up to £4 for hardwoods). Since 1919 some 126,000 acres have been planted by the aid of these grants. This is considered to be quite inadequate; at the same time the general level of silviculture has not improved.

Although there are no statistics of the size distribution of the woodland properties, which is unfortunate from the point of view of the study and planning of British forest policy, there is no doubt that the larger part of the private woodland is held in units the size of which imposes considerable limitations on management and marketing, and that few woodland owners can afford the employment of a competent forest manager. It is now generally recognized that, if private forest ownership persists, both State control and considerable State assistance will be needed to secure a standard of management compatible with the requirements of national security and proper land use.

In the present report of the Forestry Commission it is pointed out that conditions in Britain are suitable for the rapid growth of good timber, that there is sufficient land for forestry purposes available in the existing woodlands and uncultivated rough grazings, and that during the inter-war period the Forestry Commission has acquired large-scale administrative experience of the problems and has a staff of well-trained forest officers and foresters. Taking into consideration these factors and the timber requirements of the country, particularly in times of national emergency such as the present, it is proposed that 5 million acres of land should be used for timber production. This would be accomplished by the afforestation of 3 million acres of bare ground and the selection from existing woodlands of 2 million acres that are better suited to forest production than to any other use. Areas of the latter category that are in private ownership would have either to be dedicated by their owners to forestry or acquired by the State.

It is proposed that the attainment of the 5 million acres of effective forest be spread over 50 years. Two programmes of action are submitted. The 'desirable programme' calls for planting 1,100,000 acres in the first decade and 1,500,000 in the second decade; an alternative or 'intermediate programme' provides for planting 875,000 acres in the first decade.

The administrative machinery required for such an undertaking is discussed, and the importance of having a single forest authority for the whole of Great Britain is emphasized. Attention is paid in the report to amenity and recreational facilities, and proposals are made for increasing the numbers of National Forest Parks.

Descriptions are given of various technical services, such as forest research and education, and proposals are submitted. Attention is also paid to taxation of woodlands, marketing of forest produce, and forest protection.

[See also reviews of this report in *Emp. For. J.* 22, 1943 (25–31); *Scot. For. J.* 57, 1943 (4–18); *Nature, Lond.* 152, 1943 (337–9); *J. For.* 41, 1943 (689–90).]

91. SOCIAL AND ECONOMIC SIGNIFICANCE OF THE FOREST

91.1. *Rural Preservation. Reserves. National Parks*

91.1 (81). DE ASSIS IGLESIAS, F. Os parques nacionais

existentes. [**Existent national parks.**] *Bol. Minist. Agric., Rio de J.* 31 (4), 1942 (29–43). [Port.]

Notes on the Brazilian national parks.

91.5. *Value of the Forest for Colonization*

91.5 (47.1) : 97.1–2. JOKINEN, P. **A survey of colonization in Finnish State forests.** *Silva fenn.* 49, 1939 (1–53). [Finn.g.] S.P.S.

Up to 1935, more than a million acres (502,000 ha.) of Finnish State forests had been parcelled out to small owners under a law of 1922. A critical census of the results is given. The colonists have received in all some 110,000 ha. more woodland than they required for their immediate needs and have been cutting the surplus at a profit instead of clearing the land for agriculture as was originally intended. State forestry has lost more than 100 million Finnish marks by the sale of woodland to colonists at less than half its value. State forestry has also been affected by the splitting up of large forest tracts. Due to poor siting of homesteads and to the shortcomings of the colonists themselves, few of them appear to have done well. Their houses are to a large extent as poor as their agriculture. In future, more thought should be given to forestry as an export industry and less to increasing food production beyond the needs of the country itself. In any case such production should be possible by more efficient use of the soil in the southern part of the country.

91.7. *The Forest as a Source of Raw Mater als*

91.7 (54) : 38.1. **Wood as a material of construction.** *Curr. Sci.* 12, 1943 (49–50). L.S.

A brief note on the possibilities of extending the use of indigenous timbers for structural and other purposes in India.

91.8. *The Forest as a Source of Employment and Income*

91.8 (73) : 23.3 : 43.1. FARRELL, B. **Rebuilding men and resources: lessons of the American CCC.** *Aust. Timb. J.* 9, 1943 (138–9, 141). [Forestry Commission of N.S.W.]

A brief account is given of the purpose and organization, and of the training and work programmes of the Civilian Conservation Corps in the United States.

91.8 (931) : 23.3 : 24. NEW ZEALAND. **Annual report of the Director of Forestry for the year ended 31st March, 1943.** Govt. Printer, Wellington. 1943. pp. 24.

Among the proposed projects in connexion with post-war rehabilitation are the afforestation of extensive new areas and of areas adjoining present exotic forests, silvicultural operations in existing forests, and cultural operations to assist regeneration in the Kauri (*Agathis australis*) and Beech (*Nothofagus* spp.) forests. Areas already acquired for post-war afforestation total 15,000 acres, those approved but yet to be purchased total 32,000 acres, while those available for afforestation in the exotic State forests are estimated at 77,300 acres (p. 14).

91.8 : 97.1. WHEATLEY, A. B. **Conservation and democracy.** *For. Chron.* 19, 1943 (172–8). [Ontario Department of Lands and Forests.]

The useful occupation of the total manpower of a nation is the first essential necessity for the general wellbeing of the whole, as well as for the individual. This condition is dependent upon an adequate use of all natural resources, particularly the renewable portion of those resources. Potential forest land comprises a very large area in southern Ontario in addition to the total area composed of farmers' woodlots. These factors indicate that there is opportunity to make conservation in its broadest aspect, forestry activities in particular, a full-time occupation for a large number of inadequately employed people. *Author's summary.*

92. FOREST LAW

92 (68) : 94.6 : 91.1 : 98 : 43. SOUTH AFRICA. **The forest and veld conservation act (Act No. 13 of 1941) together with regulations, proclamations and government notices issued thereunder.** Govt. Printer, Pretoria. 1943. pp. 55 + map + 42. [E.Afrik.]

An act 'to amend and consolidate the laws in the Union relating to the tenure, demarcation, protection, management and utilization of forests and the regulation of veld-burning, to regulate trade in, and the use of trade names and marks in connexion with forest produce, to control the exportation and importation thereof, and to make better provision for veld, soil and water conservation.'

92 (71.6) : 96.3 : 32.21. JOHNSON, R. S. **Comments on 'An act relating to the conservation of small trees'.** *For. Chron.* 19, 1943 (179–82).

Cf. *For. Abstr.* 4 (261–2). This act, which was passed by the Nova Scotia Legislature in March, 1942, is considered to be a progressive step, particularly if it is soon to be followed by more comprehensive legislation. As now written it has three disadvantages:—(1) It discriminates against owners of large holdings. (2) It increases the inequity of forest taxation in the Province. (3) The cutting of softwoods 10 in. d.b.h. and over will be followed by extensive windfall in many stands.

92 (73) : 94.3 : 60.31.2. DANA, S. T. **Forestry legislation in the States in 1943.** *J. For.* 41, 1943 (549–60). [University of Michigan.]

A summary is given by subjects and by states of the available information on forestry legislation in the various states during 1943. The subject to receive most attention during that period was the management of privately-owned forest lands. Four states enacted laws with the object of improving present practices by public regulation, three states attempted to improve conditions by public encouragement and assistance, and three other states created special committees to study the problem.

92 (931) : 43.1. NEW ZEALAND. **Annual report of the Director of Forestry for the year ended 31st March, 1943.** Govt. Printer, Wellington. 1943. pp. 24.

An amendment to the Forest (Fire-prevention) Regulations 1940 was passed in order to strengthen the position *vis-à-vis* fire prevention and control (p. 6).

96. POLICY REGARDING PROTECTION FOREST AND DEFORESTATION

96.3 : 92 (79.5) : 60.31. MCCULLOCH, W. F. **Forest production without forest destruction.** *W. Cst. Lumberm.* 70 (2), 1943 (51–2).

Suggestions are made for strengthening the Oregon Forest Conservation Act in order that its purpose—the protection of the forest resource while maintaining forest production—can be attained.

97. POLICY REGARDING THE RELATION OF THE FOREST TO AGRICULTURE, PASTURE, AND INDUSTRY

97.1 (410). GREAT BRITAIN. **Britain's town and country pattern: a summary of the Barlow, Scott, and Uthwatt reports, with an introduction by G. D. H. Cole.** *Rebuilding Britain Series* No. 2. Faber and Faber, Ltd., 24 Russell Square, London. 1943. pp. 110. [Nuffield College Social Reconstruction Survey.]

97.1 (485) : 60.31. ARNBORG, T. **Highland soils of high productivity.** *Norrlands SkogsFörb. Tidskr.* 47, 1942 (42–63). [Sw.] S.P.S.

A general discussion, with reference to yield data, of the possibility of utilizing for rational forestry the good highland soils that are close to the timber line in north Sweden.

97.1 (67.6) : 60 : 13.15 : 13.2. BRASNETT, N. V. **Forestry and tsetse.** *Memo. E. Afr. Tsetse Fly Conf.* 1943. pp. 2.

Anti-tsetse work in the form of land planning must be based upon accurate maps, in the compilation of which air surveys are of particular value. Co-ordination of policy between all the departments concerned is also an essential feature. The best hope of combating the tsetse fly lies in planned settlement, as clearing without subsequent cultivation is liable to result in soil erosion and the deterioration of local climates and may even be followed by regrowth which is more troublesome than the original vegetation.

97.1 (7 : 8) : 56.02 : 11.21. ATKINSON, A. **A land policy for the Americas.** *Agric. in Americas* 3, 1943 (47–9). A.P.B.

Emphasis is laid on the importance of dendrochronology in helping to determine the long-term basic patterns of climatic change (particularly cycles of drought and rainfall) on which a sound agricultural policy must depend.

97.1 (77.4) : 97.2. CROWELL, R. E. **The integration of national-forest and county planning.** *Pap. Mich. Acad. Sci.* 28, 1942 (235–9). [U.S. Forest Service, Huron National Forest, East Tawas, Michigan.] O.B.

Comments on county land-use planning, particularly as it affects Alcona County, northern Michigan, an area of about 313,000 acres, 269,000 acres of which are within the Huron National Forest. Of the 107,000 acres in public ownership, 85,000 are federal- and 22,000 state-owned. The land-planning committee has classified 2,240 acres of the federally-owned lands as suitable for farm purposes, and of the areas at present incorporated in farms 5,520 acres have been classed as unsuitable for arable farming. Existing legislation permits the exchange of national-forest lands suitable for farming for forest lands of equal value, provided such an exchange is advantageous to the government; and transfers of this kind are now taking place. However, federal forest lands classified for agriculture will normally continue to produce a timber crop until the need for agricultural use arises.

97.1 (78.6 : 78.8 : 79.2–3 : 79.6). JEFFERS, D. S. **Multiple use of wild lands in the Rocky Mountain and Intermountain region.** *J. For.* 41, 1943 (627–32). [University of Idaho, Moscow, Idaho.]

97.1 (78.6 : 78.8 : 79.2–3 : 79.6) : 91.5. STEWART, G., and WIDTSOE, J. A. **Contribution of forest land resources to the settlement and development of the Mormon-occupied West.** *J. For.* 41, 1943 (63–40). [Intermountain Forest and Range Exp. Sta., Ogden, Utah.]

97.1–2 (67.6) : 11.62.31 : 91.3. GRAHAM, R. M. **Forests and post-war settlement.** *E. Afr. agric. J.* 9, 1943 (47–9).

In apportioning land for agriculture in Kenya after the war it will be necessary to keep in mind the importance of the seemingly non-productive areas of Forest Reserves in the conservation of available water supplies. A survey of the country by qualified officers of all the departments concerned is necessary in order to decide what land can best be used for immediate settlement and what further areas should be reserved for water conservation or timber production. The construction of irrigation dams might release for agriculture additional land now necessarily kept under bamboo or forest.

There is a potential local market for cheap sawn timber in Kenya, and the climate and soil are both suitable for the growth of softwoods for export. Where conditions are suitable, therefore, plantations for the production of timber could be established by the Forest Department on a scale much larger than has hitherto been attempted.

97.3 (485) : 34.21. Skogsbetesfrågan. **[The question of forest grazing.]** *Skogen* 28, 1941 (281–2). [Sw.]

Reference is made to the investigations planned by the 'Svenska vall- och mosskulturförening' (Swedish Grassland and Moorland Cultivation Society) in connexion with the grazing problem in Norrland. The purpose of the investigations is to procure basic information in different districts from which to determine the economic value of different forest associations for grazing cattle and to compare that with the reduction in forest production value as a result of grazing. Besides the forest associations proper, the investigation will include wooded grazing land, natural meadows in wooded grazing land, etc.

97.3 (485) : 34.21. Betet å kronans skogar. **[Grazing in the Crown forests.]** *Skogen* 28, 1941 (356). [Sw.]

Under prevailing conditions the Commissioners of Woods, Forests and Land Revenues in Sweden have in certain particularly urgent cases granted to private persons grazing rights in those areas of Crown forest where grazing will not cause serious injury to the trees.

98. THE TIMBER MARKET

98 (485) : 97 : 92 : 12.19.2 : 12.11.12 : 12.11.3 : 4 : 91 : 60.3. PETRINI, S. Skogsbruket, dess ekonomiska och naturliga förutsättningar. **[Forestry, its economical and natural elements.]** Lars Hökerbergs Bokförlag, Stockholm. 1940. pp. 293 + 3. [Sw.] S.P.S.

The book contains 16 chapters:—the importance of forests in the world economy; the forest conditions of Sweden; the forest industries and the raw material; forest laws and state forest policy; agriculture and the forest; forest soils and forest types; assimilation and respiration; provenance and inheritance; damage in the forest; cutting and regeneration systems; thinning methods; investigations on forest production; wood quality; specific problems in northern forestry; Swedish forest policy; principles of management and the economic goal in forestry.

98.1 (410) : 12.26–8. BANFIELD, F. S. **Home-grown timber.** *Gdnrs.' Chron.* 113, 1943 (203). O.B.D.

The curtailment of supplies of foreign timber has drawn attention to the value of home-grown British woods such as Oak, Ash, Sweet Chestnut, Willow, Poplar, Alder, Elm, Beech and Hazel. It is hoped that these species will be grown and utilized to a greater extent after the war.

98.1 (485). Vedavverkning. **[Wood cutting.]** *Skogen* 28, 1941 (209). [Sw.]

During the period Aug. 1, 1940–June 1, 1941 the quantity of wood cut throughout Sweden amounted to 33·85 million cu. m. or approximately 113 per cent. of the Fuel Commission's original programme of 30 million cu. m.

98.1 (485) : 33.06 : 65. HAGBERG, E. Inventering av vedskogstillgångarna inom Älvsborgs, Östergotlands och Kalmar län. **[A survey of the supply of wood for fuel in the Älvsborg, Östergotland and Kalmar counties.]** *Svenska SkogsvFören. Tidskr.* 40, 1942 (189–210). [Sw.]

The Swedish State Commission for Fuel has the power during the war crisis to order each forest owner to deliver a fixed amount of fuelwood. The amount that is available for this purpose can be determined from the results of the National Forest Survey, carried out during the period 1923–29, with an adjustment for the change that has taken place in the forest capital since then. To find out what this adjustment should be, a special survey was made for three counties in southern Sweden. The results of this survey show that age-class distribution is more favourable than formerly. During the earlier period the second age class (21–40 years) was dominant while now the third age class (41–60) is most extensive. Furthermore, the area of cleared land has decreased considerably. The growing stock has increased in all three counties (Älvsborg 38 per cent., Östergotland 9 per cent., and Kalmar 21 per cent. increase), the one species Spruce accounting for most of the increase.

98.1 : 97.2 (73) : 60.31.2. FIVAZ, A. E. **Wood for war.** *Soil Conserv.* 9, 1943 (27–32).

Of the 461,697,000 acres of commercial forests in the United States, 138,812,000 acres consist of farm woodlands. As these normally produce about one-third of the nation's annual forest supplies, the American farmers have an important responsibility in the production of lumber, pulpwood and fuelwood for war and essential civilian needs. In addition, forest products are urgently required for items such as wood plastics and rayons, wood alcohol, charcoal, hardboard, and plywood.

The proper harvesting of timber from farm woodlands by selective cutting will not only benefit the farmer now but should result in the improvement of his future crop.

98.1 (79.5 : 79.7) : 12.25 : 98.3 : 32.9. BRUNDAGE, F. H. **Northwest woods have gone to war.** *J. For.* 41, 1943 (654–8). [War Production Board, Portland, Oregon.]

Timber species that are equivalent to Sitka Spruce for use in aircraft construction are Western Hemlock, Noble Fir, Yellow Poplar (*Liriodendron tulipifera*) and light-weight Douglas Fir. Western White Pine, Port Orford Cedar and ordinary Douglas are acceptable aircraft woods but not equivalent to Sitka Spruce. U.S. Army-Navy specifications have been revised to meet the increased demand for aircraft woods.

The author discusses various problems related to the increased use of wood in aircraft construction, including log allocation, transportation, manpower and forest depletion.

98.1 (931) : 22.89 : 12.25 : 66 : 33.32. ***Pinus insignis* developments in New Zealand.** *Aust. Timb. J.* 9, 1943 (96, 113, 118).

Between 1924 and 1936 some 180,000 acres of forest plantations, mainly of *Pinus insignis*, were established in New Zealand by Perpetual Forests Ltd. These are now owned by New Zealand Forest Products Ltd. Harvesting of this forest is going on at the rate of 300 acres per year, but it is estimated that on a 30-year cutting cycle the area to be cut annually will have to be increased to 6,000 acres. Full utilization is made of each tree trunk, the heartwood being used for box wood and the sapwood for pulp. Annual production amounts to 18 million feet of wallboard and 50,000 cases. A brief description is given of the process of pulp production, including a new method of bark removal by flotation after the chipping operation.

98.1 : 60.31.2 : 97.2. FITZWATER, J. A., and PHILLIPS, G. R. **Forestry's part in supplying war-needed products from farm woodlands.** *J. For.* 41, 1943 (645–8). [U.S. Forest Service.]

The U.S. Forest Service is co-operating with State foresters and extension agencies in furnishing technical service to farmers in order to increase forest production from farm woodlands, to market the products on a sound basis, and to leave the woods in a satisfactory condition. This article describes the duties of the farm forester in assisting farmers and others concerned with the harvesting of farm timber, and gives the case histories of individual projects to illustrate the results that are being obtained in different states.

98.3 (4 : 71 : 73) : 94.4. MILK, R. G., and LUEBKE, B. H. **Marketing forest products cooperatively in United States, Canada, and Europe.** *Monogr. Rural Res. Ser., Univ. Tenn. agric. Exp. Sta.* No. 132, 1941. pp. v. + 42.

Short notes based chiefly on American literature and on articles in the *International Review of Agriculture*, Rome.

98.3 (485) : 33.32. Cellulosamarknaden under 1941. **[The cellulose market during 1941.]** *Skogen* 28, 1941 (345–6). [Sw.]

The export of both chemical and mechanical pulp from Sweden was restricted during 1941; Germany purchased 5,000 tons of mechanical pulp; otherwise export was limited to certain lots of dry material that were shipped to Hungary, Switzerland, and South America.

Chemical pulp factories were concerned largely with the manufacture of fodder cellulose; sulphate as well as sulphite pulp was used for this purpose.

NOTES FROM THE DAILY AND THE NON-TECHNICAL PRESS

References: 1. *Aftontidningen*, Stockholm. 2. *Berliner Börsen-Zeitung*, Berlin. 3. *Deutsche Allgemeine Zeitung*, Berlin. 4. *Domestic Commerce*, Washington. 5. *Foreign Commerce Weekly*, Washington. 6. *Frankfurter Zeitung*, Frankfurt. 7. *Neue Zürcher Zeitung*, Zurich. 8. *Völkischer Beobachter*, Berlin. The numbers in brackets indicate the reference number and the date of publication of the newspapers and journals to which the annotations refer.

Angola. The Central Department of Forestry Services of Angola plans to establish in 1943 a number of regional forests and to extend experimental work. Afforestation is to receive special attention in an effort to make up for past losses that have resulted from forest fires, fuelwood cutting, and the clearing of land for agricultural purposes. Special studies will be made in the Cabinda forest region, particularly of African Mahogany (*Khaya* spp.) (**5**; 19.6.43).

Australia. Production of high-grade charcoal from the leaves and twigs of Eucalypts is claimed by an Australian inventor. It is stated that by the new 'Eucol' process 30–40 cwt. of charcoal can be produced from 4 tons of waste material as compared with 20 cwt. of charcoal from 4 tons of wood, that the charcoal contains only 1 per cent. ash, and that the gas produced from it blends well with vaporized petrol. The waste material is mixed with brown coal and superheated steam. The residue, after the oil and gas have been lifted, consists of a charcoal of high calorific value, from which briquetted fuel can be made. By-products include branding oil, sheep dips, disinfectants, waxes, and dyes (**5**; 22.5.43).

Brazil. At the end of 1942 there were approximately 9,500 workers employed in Brazil's paper industry, as compared with nearly 10,500 at the end of 1940. This decline is attributed to the falling off in the import of wood pulp (**5**; 11.9.43).

Bulgaria. It is reported that some 20,000 ha. of waste land are to be planted with Poplars in the next few years. Over 20 species have been introduced from Germany, and several from the U.S.A. (**8**; 17.6.43).

Burma. According to a Japanese broadcast, Teak production has been resumed in Burma. Trees scheduled for cutting in 1940 and left standing because of the war will be taken first. Present stocks of Teak timber will last until the milling of these trees is completed (**5**; 17.7.43).

Canada. Canadian lumber production for 1943 is estimated at 800 million bd. ft. below the total for 1942. The decrease is attributed principally to labour shortages (**5**; 4.9.43).

Czechoslovakia. A new concern, 'Preslejka', has recently been organized at Zarnovica to build the first plywood mill in Slovakia. Operations are expected to start by the end of 1943 (**5**; 17.7.43).

Germany. The cut in Germany's forests has been fixed for the forestry year 1944 (1943–4) at 80 million solid cu. m.; the corresponding cut in 1943 was 70 million and in 1934 48 million cu. m., with 56 million cu. m. being considered as 'normal'. It is expected that the increase in the cutting programme will create very serious problems of labour and transport (**2**; 8.10.43, **3**; 8.10.43, and **7**; 28.10.43).

The first German efforts to use power saws in felling trees date to about 1920, but by 1938 only 100 power saws were in use. At present the number is about 5,700. The saws are serviced by crews of 2 men, and are used in cross-cutting and trimming as well as felling. Three units are common:—(1) a petrol unit; (2) an electric 2·2 K.W. unit; (3) an electric 1·7 K.W. unit. The electricity is generated in the forest. The cost of a unit is about 1,200 Mark. Workmen wishing to acquire a saw receive a State subsidy of about 300 Mark and an interest-free loan of 600 Mark repayable within 2 years (**6**; 16.3.43 and **8**; 17.3.43).

Iran. Iranian forests are divided into five categories:—

(1) The forests of the Caspian coastal region are the most valuable. They cover an area of about 8,892,000 acres, extending from Bujnurd in Khorassan to Astara in Azerbaijan. The principal trees are Boxwood, Oak, Cypress, Elm, Ash, Beech, Walnut, Maple, Alder, Ironwood, Linden, Poplar, Willow, Silktree, Locust, Persimmon, Sycamore, Olive, Mulberry, Hazel, and fruit trees such as Cherry, Apple, Quince, and Pear. In this region, 3,211,000 acres are classified as 'thick' forests yielding 2,143 cu. ft. of wood per acre, 2,964,000 acres as 'medium' forests yielding 1,071 cu. ft. per acre, and 2,223,000 acres as 'low' forests, which have little commercial value.

(2) The Oak forests, which extend from the Sardasht Mountains in western Azerbaijan to Kazerun in the south, comprise an area of about 27,911,000 acres. Other species of trees include Ash, Maple, Wild Pistachio, Wild Almond, and fruit trees.

(3) The dry and limestone mountain forests, which cover an area of approximately 3,200,000 acres, are of little economic value. The principal tree is Cedar (*Cedrus libani*).

(4) The Pistachio forests are located in the deserts and mountains of the southern and eastern part of the country, in the Great Salt Desert, and in desert areas in Anarak and Yezd. Wild Almond and Tamarix are also found in these forests, which have an area of about 6,916,000 acres. The forests are of some economic value, particularly as the Wild Almond can be grafted with the cultivated Almond.

(5) The tropical forests, which contain mainly hardwoods, are found in the area near the Persian Gulf, and comprise about 1,335,000 acres (**5**; 1.5.43).

Japan. According to a Japanese broadcast, efforts to grow Cork Oak (*Quercus suber*) trees in Japan have finally been successful. Several industrial concerns are said to have decided on large-scale planting of Cork Oaks (**5**; 9.10.43).

Nicaragua. Andiroba [*Carapa guianensis*], a tropical hardwood found in Nicaragua, may prove a substitute for Mahogany in the manufacture of plywood for mosquito boats and aircraft; samples of the wood have been sent to the United States for tests. The tree, which is known locally by the names 'pochote' and 'cedro macho', averages 100 ft. in height and probably belongs to the Mahogany family. It is estimated that about 2,000,000 bd. ft. of Andiroba could be shipped within a twelve-months period (**5**; 2.10.43).

Norway. The Norwegian wood-charcoal industry is growing rapidly as a result of shortages of coal and petrol. Charcoal plants are being established in all forests districts. A plant at Drammen near Oslo is said to produce 5,000 hectolitres of wood charcoal per day (**5**; 12.6.43).

Panama. A search for war materials has revealed forest resources in Panama that may prove of commercial importance if developed and expanded. Cuipo [*Cavanillesia platanifolia*] wood, a possible substitute for Balsa, is abundant. There are also scattered stands of Mahogany and other cabinet woods, now processed chiefly for domestic use (**5**; 31.7.43).

Sweden. Some 25,000 workers engaged in forestry and to a certain extent in agriculture have left their work during the period 1st September, 1939 to 30th September, 1942. The reason the workers have transferred to other employment is that they fear that forestry will not afford them a livelihood in the future (**1**; 6.2.43).

United States. The following data on lumber supplies refer to the first half of 1943. Lumber consumption, which declined by 13 per cent. in comparison with that for the same period of 1942, was, however, in excess of production, and stocks have shown a further decline. Lumber production is estimated at 16 million bd. ft.; although this is equal to half the production objective for the year, as set up in January 1943, there is no certainty that the full requirements for the year will be satisfied.

During the first six months of 1943 receipts of pulpwood at the mills were 24 per cent. less and woodpulp production was 17 per cent. less than for the same period of 1942. A drive to promote the cutting of more pulpwood, particularly in farmers' woodlots, is being carried on, largely through advertising and educational efforts, by the War Activities Committee of the Pulpwood Consuming Industries and by the American Newspaper Publishers' Association. It is reported that, as an aid to pulpwood logging and delivery, the War Production Board will grant high priorities for lorries, tractors, loading equipment, etc. (**4**; October, 1943).

U.S.S.R. According to press dispatches from Moscow a large increase is expected in the amount of timber to be rafted in 1943. There will be a heavy demand for timber for reconstruction in recovered territory, particularly since timber is being used extensively as a substitute for metal. Wood is replacing steel in the rebuilding of a number of factories that have been destroyed. The Stalingrad sawmill continued to operate during the battle and produced material for army aerosledges. This mill is now supplying timber that is urgently needed for household furniture (**5**; 29.5.43).

According to reports from Germany, about 190,000 sq. miles of forest land in White Russia, in the vicinity of the headwaters of the Dnieper, Pripet, Desna, and Beresina rivers, were recently surveyed from the air, in order to form an estimate of the resources available for exploitation in that region (**5**; 19.6.43).

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